

# Subject Index

I numeri romani indicano il volume, quelli arabi la pagina, quando una coppia è seguita, nel corpo della medesima voce, da soli numeri arabi, richiamano pagine del volume indicato dalla prima coppia.

**agrarian astrology**, doctrine of the four properties by Aristoteles, Crescenzi, I, 196-197

**agrarian astrology**, doubts about usefulness, Herrera, I, 218; demonstration unsubstantiality, De Serres, I, 433; pruning time, groundlessness of moon influence, La Quintinye, II, 40; re-examination on the base of atmosphere physics, De Gasparin, IV, 170

**agrarian astrology**, key role of the zodiac, Virgil, I, 53-54, *Geoponica*, I, 150; role of the planets, id., 150; of the moon, Crescenzi, I, 201; combination of moon & planets, Alamanni, I, 246

**agrarian botany**, De Candolle's *L'origine des plantes cultivées* underlines unimportance uniqueness or plurality ancient etyma, VI, 9, unreliability glottologists' works, id., 9, mere presumptive value sources, necessity different sources accordance, id., 9, problems to be solved for the progenitors and original region identification, id. 2 and successive displacement, id. 3, utilisation knowledge of botany, archaeology, paleontology, history, glottology, with specific caution for every source, id. 5, analysis predecessors mistakes, id., 6-7, the results, ordered in a list based on utilized organs, id. 10, establishes the origin's place of 247 spp., whose only for 169 progenitors were identified, id., 21-23

**agrarian botany**, cultivated spp. classification, identification physiological & ecological attitudes to exploit N resources & water, Vavilov, VII, 38-40, model classification for future germoplasm banks, id. 43-45

**agrarian botany**, need to study economic vegetable potential, Weston, II, 15, to enlarge cultivated spp. range & to improve knowledge of indigenous spp., id. 15

**agrarian botany**, almond tree, *Amygdalus communis*, hypotheses about origins & morphological evolution., Rozier, III, 102-03, experiment to delay blossoming by grafting on prune and peach stocks, id., 103-04

**agrarian botany**, artichoke, *Cynaria scolimus*, Hungary, planting & cultivation, Mitterpacher, III, 52-53

**agrarian botany**, ash-tree, *Fraxinus elatior*, imaginary power of leaves against serpents, Pliny, Herrera, I, 218

**agrarian botany**, asparagus, *Asparagus officinalis*, forced cultivation, Roda, V, 222-23

**agrarian botany**, aubergine, *Solanum melongena*, multiplicity of varieties in Arabic countries, Al 'Awwâm, I, 163

**agrarian botany**, *Avena strigosa*, hypothesis about original region, Harlan, VII, 323

**agrarian botany**, banana, *Musa acuminata*, peculiarities, origin, varieties, historical data, De Candolle, VI, 15-17; cultivation in Moorish southern Spain, Al 'Awwâm, I, 182

**agrarian botany**, wild barley, **Hordeum spontaneum**, vastity original area, from Near East to Turkmenistan and Afghanistan, key species of park forest biocenosis, weed in wheat fields, less cold resistant than primitive wheats, exastic trait is considered a domestication consequence, Zohary, VII, 234-35, because of original area vastitude taming place has not yet been identified, id., 235; Harlan hypothesis, VII., 266

**agrarian botany**, barley, *Hordeum vulgare*, Graeco-Roman era, importance in Mediterranean countries, Jardé, I, 133; types, times & culture technique, Heresbach, I, 358

**agrarian botany**, beans, *Phaseolus*, oriental species, Al 'Awwâm, I, 162

**agrarian botany**, cassava, *Manihot esculenta*, characteristics, origin, historic information, subsp., De Candolle, VI, 10-11; varieties, modes of triturating & cooking of Caribbean Indios, Sturtevant, VII, 243-44

**agrarian botany**, chesnut, *Castanea sativa*, fruit utility, wood's properties, Evelyn, II,

58; staple role on Tuscany mountain areas, an inheritance to care of, Ridolfi, IV, 320

**agrarian botany**, chick-pea, *Cicer arietinum*, cultivation, properties, Crescenzi, I, 204

**agrarian botany**, crocus, *Crocus sativus*, origin, peculiarities, historic information, De Candolle, VI, 14

**agrarian botany**, fig, *Ficus carica*, expedients for plantation & tree-cares, Palladius, I, 146-47; Davanzati, id., 367

**agrarian botany**, flax, *Linum usitatissimum*, botanic traits, origin, historic informations, subspecies, De Candolle, VI, 12-13

**agrarian botany**, foxtail millet, *Setaria italica*, original region hypotheses Harlan, VII, 250

**agrarian botany**, fuller's teal, *Dipsacus fullonum*, importance for 16th cent. textile industry, I, 300-301; the choice of soil, cultivation procedure, Gallo, I, 300, criteria to choose the heads, id., 300-301; De Serres, id., 423

**agrarian botany**, hemp, *Cannabis sativa*, 17th cent. Bologna, quality preeminence, Tanara, I, 466; beginning 19th cent, production apogee, Re, III, 307

**agrarian botany**, leek, *Allium ampeloprasum*, culture & properties, Crescenzi, I, 207-08; Estienne, I, 251

**agrarian botany**, *Leguminosae* for human consumption, species, cultivation, Columella, I, 76, 78; Thaer, III, 212; Ridolfi, IV, 297

**agrarian botany**, *Leguminosae*, cultivation, seed-crop quantity, Columella, I, 72

**agrarian botany**, lucerne, *Medicago sativa*, Columella, I, 75; Gallo, I, 297-98; De Serres, I, 388

**agrarian botany**, lupine, *Lupinus albus*, supposed therapeutical properties, Crescenzi, I, 204

**agrarian botany**, maize, *Zea mais*, culture's history, cultivation technique, Burger, IV, 8-9; 18th cent. Lombardy, 3 main varieties: long cycle, middle, short, Amoretti, III, 63, seeding in lines, progressive tuft earthing up, id., 63; genetic variability, adaptability to different environment, strains instability, Ridolfi, IV, 300; negative results of Italian early varieties in Germany, Thaer, III, 216; confidence in their diffusion, Burger, IV, 9; drying in granaries through stoves, Thaer, III, 216

**agrarian botany**, melon, *Cucumis melo*, culture, French gardeners procedures, De Serres, I, 415-16, cool regions, hot-bed culture, id. 417-18; cultivation, Ridolfi, IV, 428

**agrarian botany**, millet, *Panicum miliaceum*, relative importance, Pliny, I, 132, 16th cent. Lombardy, varieties multiplicity, Gallo, I, 294, cultivation technique, id., 29; hypotheses on origin region, Harlan, VII, 250, *Panicum miliare*, hypotheses on origin's region, id., 250

**agrarian botany**, olive tree, *Olea sativa*, hypotheses about introduction in Italy, Vettori, I, 370-71; history, geography, taxonomy of cultivated varieties, Caruso, V, 226-228; Niccoli, VI, 239

**agrarian botany**, pea, *Pisum sativum*, Darwin states that extreme variability would prevent any definition of rules in combining different traits, V, 117; his ignorance of Mendel discovery, id., 118

**agrarian botany**, pear, *Pyrus communis*, varieties of the gentleman's orchard in seasonal succession, Gallo, I, 306; La Quintiye, 121 varieties, II, 37

**agrarian botany**, pepper, *Capsicum annuum*, origins in southern & central America, Pickersgill, VII, 437-38

**agrarian botany**, plum, *Prunus prunus*, nourishing properties, Gallo, I, 307

**agrarian botany**, potato, *Solanum tuberosum*, whose originis Vavilov places in Chile, VII, 55; diffusion times in Europe, Thaer, III, 215, in Germany in Friedrich II war time, id., 215; general rejection by peasants, III 320; diffusion in France by Parmentier, III 32, VII, 550; in Austria by Burger, IV, 10;; high productivity around Varese, Dandolo, III 320; first trials in Tuscany, Ridolfi, IV, 408; diffusion in southern Italy, Quartapelle, III, 134-35

**agrarian botany**, pumpkin, *Cucurbita pepo*, introduction of American species, I, 361

**agrarian botany**, quince, *Cydonia oblonga*, picking up and preservation procedures, Alamanni, I, 241

**agrarian botany**, rice, *Oryza glaberrima*, hypotheses on origin region, Harlan, VII, 250, *Oryza sativa*, Chinese origin proved by chronicles on wild rice reaping by poor, culture would have diffused from southern regions, the first rice being the strain *Japonica*, Ping-ti Ho, VII, 252

**agrarian botany**, rye, *Secale cereale*, hypotheses on origin region, Harlan, VII, 323

**agrarian botany**, sainfoin, *Hedisarum coronarium*, Italian *sulla*, Tull, II, 88, Marche di Urbino, cultivation on poor soils, Re, III, 320

**agrarian botany**, sorghum, staple of first Chinese agriculture, Vavilov, VII, 50; *Sorghum bicolor*, hypotheses on original region, Harlan, VII, 250

**agrarian botany**, teff, *Eragrostis tef*, economic role wild cereals in Africa till '900, Harlan, VII, 250

**agrarian botany**, teosinte, *Euchlaea mexicana*, proof titles of maize parent by crossing with maize & verification reappearing maize spikes at second generation as established by Mendel laws, unsubstantiability proves parental links with *Tripsachum*, Beadle, VII, 331-32

**agrarian botany**, tomato, *Solanum lycopersicum*, origins in Central & Southern America, Pickersgill, VII, 326

**agrarian botany**, tobacco, *Solanum nicotiana*, first specimen in Europe, Estienne, I, 231-32; absurdity culture prohibition in Europe, Smith, II, 323, surface cultivated by a slave, Smith, II, 323; varieties grown in Lecce province during '800, Onorati, III, 142

**agrarian botany**, vine, *Vitis vinifera*, species' story from Eocene fossils, Niccoli, VI, 218-19

**agrarian botany**, wheat ancestors, *Triticum boeoticum*, *Monococcum's* ancestor, origin's area between Turkey, Siria, northern Iraq, Greece and Transcaucasia, corresponds to the area's vastness ample variability, Zohary, VII, 233

**agrarian botany**, wild emmer, tetraploid, wheat, *Triticum dicoccoides*, origin's area between Israel, Giordania, ample variability, between Galilee Sea types and those of Hermon Mount, a month difference in reaping times, between Irak and Iran grows *Triticum araraticum*, endowed by similar traits but intersterile, Zohary, VII, 234

**agrarian botany**, emmer, *Triticum dicoccum*, tetraploid, the most common grain in Roman Italy, cultivation area and varieties, I, 134, first cultivation evidence in upper Jordan Valley, VII, 234

**agrarian botany**, durum wheat, *Triticum durum*, tetraploid, identification research among Latin denominations, I, 136; multiplicity of strains, Jardé, id., 136, cultivars diffused in Campania, then Naples kingdom, Bruni, IV, 342

**agrarian botany**, Eincorn Wheat, *Triticum monococcum*, diploid, cultivation origins in southern Tukey, Zohary, VII, 339; Harlan hypothesis, VII 250

**agrarian botany**, wheat, spelt, *Triticum spelta*, identification research among Latin denominations, I 134-135, diffusion and cultivation, Heresbach, I, 356-57; milling quality, De Serres, I, 385-86

**agrarian botany**, Rivet Wheat, *Triticum turgidum pseudocervinum*, teraploid, present in 16th century France, De Serres, I, 385

**agrarian botany**, wheat, *Triticum turgidum*, tetraploid, identification research among Latin denominations, Jasny, André, Le Bonniec, I, 134-35

**agrarian botany**, wheat, *Triticum aestivum (vulgare)*, exaploid, genome multiplicity and geographic diffusion, I, 130-31, 135-37, diffusion clues in historic ages, I, 131, identification research among Latin denominations id, 134; species' origins hypotheses, morphology, Poncelet, III, 96; fom *Aegilops triticoides* Fabre IV, 301, De Candolle, VI, 18-19, agreement of supposition of a cradle between Tigris and Euphrates, id., 25 classification types, Haller, Beckman, III, 50; Linnee, III, 96, influence of maritime trading on hulled species diffusion

**agrarian botany**, review of wild spp. whose seeds had been traditionally reaped in

Africa, Harlan, VII, 325-26

**agrarian botany**, pharmaceutical species, catalogue & specific properties, Crescenzi, I, 207; Gallo, I, 307-08; cultivation expedients, De Serres, I, 418-19

agrarian institutions, 17th cent., the informal circle which reunited around Bacon & Hartlib with the task to examine inquiries about natural & economic facts, Hartlib, II, 10; Weston, id., 12-13

**agrarian institutions**, schools, end 19th cent. Denmark, the Bernstorff's far-sighted social politics, Giglioli, VI, 183-84, popular schools & budget allocations, id., 184

**agrarian institutions**, 18th cent., Accademia dei Georgofili foundation proposed in 1753, but long competition between evanescent statutes, proposed by Montelatici & T. Tozzetti, II, 212-14; society guidelines in the Alamanni footsteps, id., 212

**agrarian institutions**, 18th cent., Europe, foundation of agrarian societies, II, 229-30; France, 1761 constitution Société d'agriculture de Paris, id., 214; Italy, dates foundat. agrarian academies, Niccoli, VI, 235

**agrarian institutions**, extension among peasants, first experience in Hapsburg Empire diffusing Mitterpacher text, III, 41-42, scientific clime in first 19th cent. Europe kindles divulgation programs in all the advanced countries, III, 42-43; Denmark & Holland VI, 184; increasing need of institutions which divulgate new discoveries amongst peasants to collect the fruits of research investment, IV, 83 Ridolfi, id. 269

**agrarian institutions**, education, end 19th cent. Italy, *scuole pratiche di agricoltura* [schools of practical agriculture], among which special schools of vine cultivation & animal breeding, Stringher, VI, 190; the national education institutions panorama, Niccoli, VI, 234-235

**agrarian institutions**, 1799, Von Felleberg takes on the direction of Hofwyl, IV, 1; 1807, distinction between advanced Institute & agrarian elementary School., id. 1, the soil ideal lynchpin of his teaching, id. 3 agrarian institutions of 19th cent., purposes definition, IV, 84-87

**agrarian institutions**, 1803 found. Weihestephan Institut, III 181; Schönleutner director after a stage with Thaer, IV, 6, experimental design homogeneous to Thaer's principles, id. 7

**agrarian institutions**, 1806, Block founds Schirna Institut, III 182

**agrarian institutions**, 1806, Thaer buys Möglin estate, III 182; 1819 because of ruling costs conversion in Agrarian School of Prussia Academy, id. 183

**agrarian institutions**, 1818, foundat. Hohenheim Institut, III 181; Von Schwerz pursues a project opposite to Möglin's, educating peasant farms instead of landowners, IV, 5

**agrarian institutions**, 1830, Granata's endeavour to create an experimental farm in the Naples Kingdom, IV, 86-87

**agrarian institutions**, 1831, Braunschweig, conversion of Collegium Carolinum as an experimental farm, the direction committed to Sprengel, IV, 12

agrarian institutions, 1834, Ridolfi creates a school-farm at Meleto Castle after comparing German institutions & choosing Hofwyl's model, IV, 259

**agrarian institutions**, 1840 foundation Agrarian Chair in Pisa; 1844 conversion in University agrarian School, IV, 259, 1855; Ridolfi called to Florence by Great Duke, Cuppari charged of temporary direction, id. 259; 1859, Cuppari full right director, id. 363

**agrarian institutions**, 1843, after a gleaming manufacturing success Lawes founds Rothamsted experimental farm, choosing Gilbert, a Liebig disciple, as director, IV, 89-90

**agrarian institutions**, 1870 foundation by Cantoni of Milan Scuola superiore, V, 164

**agrarian institutions**, 1875, foundation Stabilimento sperimentale di zootechnia (Zootechny Experimental Establishment) in Reggio E., the direction committed to Zanelli, V, 187-220

**agrarian institutions**, 19th century end Italy extension, new formulae for the new procedures diffusion, the "*cattedre ambulanti*" (Itinerant Lectureship), , formula's resil-

ience favours exceptional men, Stringer, VI, 190-91, the great “walking professors”: Poggi, Bizzozero, Sansone, Zago, Savastano, Munerati, Peglion, id., 191; analogous institutions, Niccoli, VI, 192

**agrarian institutions**, 1892, foundation Federazione italiana dei consorzi agrari (Italian Federation of Agrarian Consortia), Cavaliere president, Raineri general manager, VI, 191, 192

**agrarian institutions**, 19th cent. France’s new vitality, 1822 foundation Renville, 1826 Grignon, 1830 Grand Jouan, 1842 La Saulsaie, 1848 Versailles, IV, 86; 1860 Vincennes, V, 161

**agrarian institutions**, 19th century India endeavours to create research institutions number without any true results, 1865 foundation Saidapet experimental station, which will have ephemeral life, Kumar, VII 439-441; 1890, mission from London of Voelcker, who writes reports & presides 3 conferences of regional officials to create agrarian colleges all of which close without any conclusion; 1905 first research station founded by viceroy Curzon at Pusa, Bihar, with funds offered by an American Maecenas, Phipps, whom India will honour as the national agrarian science promoter, id. 441; 1929 imperial governm. founded Imp. Council to promote research, after independence it will be named Indian Council for Agric. Research, maintaining either its acronym and the date of the British foundation, in 2013 supervised programs of 99 experiment. organisms & 53 university campuses, id 442; after independence a fierce debate in Parliament between champions of Brahminic tradition & Western science, which Empire had not rooted in India but which I. Gandhi imposed for preventing great hungers, id., 443; the institution created by Phipps & transferred to Delhi, performs the functions of a bridge to introduce new biochemical & genetical knowledge in the constellation of universities & experimental stations, id. 442

**agrarian institutions**, 19th cent., directors of new schools standard bearers of new agriculture, IV, 88

**agrarian institutions**, framework, 20th century, research centres multiplication changes development pathways: the team substitutes the great scientist, VI, 176

**agrarian institutions**, Australian Centre for Plant Functional Genomics Ltd., a characteristic creature of the new business-research strategy born from a joint venture among scientif. & commerc. bodies & ran in the form of a commercial company; identified goals, on their base specialists with curricula assuring the needed competence are engaged from research or commercial organisms, VII, 429-430; Australia comprises immense plains, but aridity severely limits production, research goals are evaluated measuring the farmer’s profit for 1 kilo more in the yield of every ha; knowing that wheat sensibility to aridity is directly linked to Na metabolism, the Centre has directed a major exertion to the research, in wheats of international collections, of the genes controlling Na concentration, verifying, in the juice of the third leave of wheat progenitors, a Na presence from 5 to 250 millimoles, a huge difference, which explains the very different reactions to aridity; when identified a wheat with ideal concentration, theoretically genomics makes it possible to draw the genes responsible for every reaction involving the element from the root to the leave & insert them in the plant one aims to breed, id., 430; it is noteworthy to observe that the responsables of the institute approach any interlocutors in the style of selling managers, as they would offer cars or televisions, presenting videos about the Institute research works as commercial catalogues, id. 431.

**agrarian institutions**, end 19th cent. France, universities & experimental institut., research organisms, budget allocations, Giglioli, VI, 181-183; De Dombasle inheritance, Bella, Rieffel, Nivière, Grandeau & Dehérain achievements, id, 182-83

**agrarian institutions**, end 19th cent. Great Britain, univers. & experiment. institut. inventory, Giglioli, VI, 177-78

**agrarian institutions**, end 19th cent. Germany, universities & experimental institution inventory, budget allocations, Giglioli, VI, 179-80; bodies created by Kühn at Halle, id., 179; the inheritance of Von Schwerz, Staudinger & Schönleutner, id., 180

**agrarian institutions**, end 19th cent. Italy, till 1870 the only university-level schools in Pisa & Milan; 1870 foundation of experimen. stations where province administration contribute to exiguous state funding, Udine, Modena, Turin, Rome, Lodi, Giglioli, VI, 187; stations reach number of 15 in 1905, special stations created for wine & cheese making & cereals breeding, id. 188; funding problems, id., 188; the vicissitudes of an experimental program, id., 189; reaction to emptiness of Ottavi criticism, Cugini, VI, 189

**agrarian institutions**, Kärtner Landwirtschaftsgesellschaft, Burger's achievements, IV, 9-10

**agrarian institutions**, Leibniz-Institut für Pflanzengenetik born in Saxony where S. U. army trasfers collection of germoplasm take out in countries occupied by German army & temporarily placed in the neighborhood of Vienna. The conservation was committed to an organism in 1943 named Kaiser-Wilhelm Institut, whose seat was established in the castle of Gaterlsleben; after Germany re-unification, in 1992 , the new denomination sanctioned a new statute, new devices equipment & a vast resort to researchers from the whole world; in 1999 the budget resources were 40.132 million €, VII, 409-411; the linchpin of activity the germoplasm kept by the Dept. of Genebank, which holds 126,837 botanic entities prevalently kept in cooled milieu, with a specimen committed to Svalbard Islands Global seed Vault, systematically reproduced & subjected to viability tests, id., 411; 1° Dept. comprehends 8 teams., one concerned with genomes-study, barley being the center of the work, those of 225 varieties being yet transcribed, so to allow analysing the phenotypic expressions of every possible combination of genes, id., 412; a different team is concerned with Plant Architecture, that is the research of the correlations between the genetic endowment & the spike structure of barley & wheath, one investigates the genetic bases of seed senescence, another one searches into Experimental Taxonomy, barley being again the first object of every experiment, id., 413-414; the team concerned with Taxonomy of Plant Genetic Resources started field campaigns in regions which were the cradle of domestic species, aiming to verify the Vavilov's hypothesis on Allium taming, id., 415; The 2° Dept. deals with the matter of *Cytogenetics and Genome Analysis*: at the center of its interest the long ran mutations in living creatures, looking at singling out the multiplicity of factors concurring, directly or indirectly, to the continuous vegetable metamorphosis; among the items of research, the polyploids origin & the arising, in some species, of apomixis, id., 416; in the general framework a team aims to understand the *Kariotype Evolution*, the first research purpose being the causes of the expulsion of a parental chromosome in barley obtained by the hybridization of two different species of the plant, id, 416; apomixis study is the specific goal of a team which explored the peculiarities in the reproduction of 650 strains of *Hypericum perforatum*, a species which combines the apomictic process to the ordinary one, expression of a philosophy aiming at the same phenomenona from a plurality of perspectrives; the 2nd Dept. also comprehend a team concerned with *Genome Plasticity*, id., 417, which performed important researches about the different location, on the chromosomes, of genes responsables, in different plants, of the same functions, id., 417; integrates the work of teams engaged on the specific genetic terrain the one working on the epigenetic sphere, which studies the phenomena involving the gene when, separated from the chromosome, is duplicated & becomes converted in a tool for transcription reactions, a phenomena context investigated bringing into action or stopping the transcription mechanisms, id., 418; faces a peculiar sphere the team concerned with *Transcriptome Analysis*, verifying how much, on the occasion of a parasitic attak, the damage would be greater in relation to the parasite's ability to affect the production, through the transcription, of defence factors; essenial functions are committed also to the team working on *Gene and Genome Mapping*, eminently engaged in the study of the genes which keep part, in barley, to the N metabolism & to the reactions which include it in proteins, a key elements of crops, as well as barley, 358 wheat strains were investigated, id., 419; the 3th Dept. is entitled to *Molecular Genetics*, an expression in practice translated in the goal of understanding the mechanisms of the productive vegetable performance; having verified that major

achievements in this sphere during the 20th cent. were obtained by the heterosis exploitation, the team projects are predicated on the supposition that the knowledge of the molecular heterosis mechanism would allow to arrange the pure lines to hybridize with completely new procedures, so to obtain hybrids of new productive potential; for the experiments performed the maize had been chosen, a plant for whose heterosis a level of knowledge exists unmatched by any other plant, id., 419; the same Dept. comprises a team dealing with the possibility to enhance, utilizing molecular knowledge, the heterosis benefits, another one concerned with the process of *Seed Development*, a phenomenon of storage which withdraws typical reserve compounds from the other plant's organs, so multiplying the yield weight, a team engaged in the study of *Gene Regulation*, studying the mechanisms at work in the phase of gametophyte formation & that of embryogenesis, id., 419-420; reaching the extreme biology's borders the Dept. comprehends a team dealing with *Molecular farming*, the expression chosen to define the researches about the possibility to make the plants to produce, by the introduction of specific genes, antibodies to be used in human medicine; successful experiments have introduced in tobacco the genes which codify for the composition of proteins used by spiders to produce their gluey silk, id. 421-422; then the report illustrates the activity of three teams engaged in systematic development of procedure for data recording & filing so to have them functionally available for all the institute's laboratories, id. 422; the report then illustrates the work of the team engaged in the purpose, for decades vainly pursued by major seed companies, to produce the *Hybrid Wheat*, which follows after having obtained the insertion in the wheat genome of a bacterial enzyme which will express in the tapetum of the pollen spore dissolving its beginnings & so producing the male-sterility of the plant, the preliminary condition for the hybridisation, id. 423; the 4th Dept. is operating on the terrain of *Physiology and Cell Biology*, an expression which identifies the purpose of converting the description of all of the physiologic phenomena of the plant-life in that of the corresponding cellular processes; the project comprises the goal to obtain diploid genomes where all the alleles are identical, so to avoid any possibility that one of the two may mask the interaction of the other with some different gene of the entire genome, id. 423; a team of the Dept. studies the mechanism by which, to counter-attack a fungine invasion, a plant sacrifice the cells contiguous to the invaded ones killing them, id. 424; a team of recent constitution will study the root system dilation in the case of wealth, in the soil, of ions of metabolic value, a parallel project aims to verify the possibility of stimulating N absorption from cereals by inoculating fungi with the property to stimulate root activity; a third project investigate the process of mobilization, when the plant begins its senescence, of the N present in the vegetative organs, a study which still has identified the specific responsible N-vectors, id. 424; the report then illustrates the support ensured by a special service of microscopy to the most advanced cellular researches of any different sector, enunciating the goals of a study about some elements of photosynthesis process which will be performed in cooperation with an Indian institute, id. 425; a team of the Dept., entrusted with investigations about *Plant Reproductive Biology*, is dealing with pollen embryogenesis, aiming at the knowledge of the genes which control the process, amplifying the potential of the results of the teams working on the same terrain; specific experiments aim to improve the use of *Agrobacterium tumefaciens* as a shuttle for gene transposition, id. 426; the team dealing with *Yeast Genetics* aims to verify which genes of prokaryote creatures living in salty or brackish waters could be transposed in tame plants making it possible their life in regions lost to agriculture because of salinity induced by centuries of poor irrigation practices, id. 427; the last chapters of the German Institut account propose a plurality of observations about the utilisation of systems-dynamics in the manipulation of experimental data, & underline the importance attached, in every & all the spheres of the Inst. activity, to the mathematic modelling; if first 20th cent. genetics did obtain extraordinary results trasposing, by crossing, a few genes of plants never before manipulated, the future genetics successes will rise by engineering plants in which hundred of genes will be composed in a new genome for which the interac-

tion of every gene with thousands of different ones should be perfectly foreseen, a task which presupposes the availability of calculation methods as perfect as those by which the Institute researchers have identified, in laboratory, the properties of hundreds of alleles which often differentiate in their behaviour in combination of possibly very rare genes, id. 428

**agrarian institutions**, Low Countries, 1876, foundation of Wageningen Faculty & new zootechny techniques diffusion among peasants, Giglioli, VI, 184

**agrarian institutions**, Naples Kingdom, model farms, the Cardito Royal Estate of Fernando IV, III, 153-154

**agrarian institutions**, the Pommerschen Ökonomischen Gesellschaft, the Sprengel activities, IV, 12-14

**agrarian institutions**, U. S., 1862, foundation of an agricultural college in every state, 1887, constitution of an agric. experim. station in each state, budget allocations, Giglioli, VI, 185-86

**agrarian international institutions**, successes of CIMMYT, which in 1966 acquires an international statute, & IRRI, inspire, in 1971, the World Bank & some developed countries to constitute CGIAR, which will gather together & co-ordinate yet existing organisms & promote the creation of new ones, if considered necessary in peculiar research spheres or specific geographical areas. In 1967 born CIAT in Colombia & IITA in Nigeria; in 1972 ICRISAT in India; in 1973 ILRI in Kenya & CIP in Peru; in 1974 IPGRI in Roma; in 1975 ICARDA in Siria & WARDA in Ivory Coast; a constellation completed in following years, VII, 352-53; 2000, structure, budget & intervention areas of CIMMYT, id., 353-55; tasks definition, id., 358-59

**agrarian literature**, systematic design, Columella, I, 60-63; Gallo, id., 278; Tanara, id., 465; proposal of a new presentation order, T. Tozzetti, II, 214; Onorati, III, 136-140; the encyclopaedic method, Rozier, III, 82-83, its incompatibility with alphabetical order, id., 84-85; a systematic plan in modern science horizons, Thaer, III, 184-85, id., 246; De Gasparin, IV, 153-54; inconsistency his *tableau*, id., 155; essential knowledge review at the middle of 19th cent., IV, 162

**agrarian literature**, Greek authors information, Varro, I, 25

**agrarian literature**, Latin writers, I 33; Columella, id., 60

**agrarian literature**, the dialog as didactic genre, Xenophon, I 25; Varro, id. 40; Gallo, id. 273; Heresbach, id. 349-350

**agrarian literature**, patent banality agricultural practices, Xenophon, I, 26-27; obviousness agriculture works makes it useless to search for the "invention" as it obliges to suppose multiplicity of beginnings, Bronson, VII, 257; Cohen, id. 260

**agrarian literature**, writers in Arabic, I, 157-58, the Latin influences, I, 158-59

**agrarian literature**, early Middle Ages, the Byzantine tradition, I, 147-48, the authors in Western courts and abbayes, id., 153

**agrarian literature**, 15th & 16th centuries, impulses from humanistic culture, I, 271-73, 276, 277, 297, 431-432

**agrarian literature**, 16th cent. last decades Italy, works character; Gallo's influence, I, 359, 362, 364; his knowledge transcribed by De Serres without any mention, id., 378; authors known (seldom quoted) by De Serres, I, 378

**agrarian literature**, 16th cent., French school beginning, I, 247; progressive connection with experimental science, the influence of Reformation philosophy, I, 431-32

**agrarian literature**, 17th cent. Italy, torpor century, I, 461; rhetoric pre-eminence on science, id., 462; Tanara, id., 465

**agrarian literature**, 17th cent. Italy, torpor century, I, 461; rhetoric pre-eminence on science, id., 462; Tanara, id., 465

**agrarian literature**, 17th cent. English school vigorous starting, II, 9-20; 72, 73

**agrarian literature**, 18th cent., wish that Italy keep part to European agronomic effervescence, Muratori, II, 101-102

**agrarian literature**, 18th century English authors, Columella's influence, II, 62; claim



of Classical writers inconsistency, Tull, id., 93-94

**agrarian literature**, Tull's influence in renewing the layout of an agronomical treatise, II, 74

**agrarian literature**, 15th-19th centuries, the *grand tour* in Italy, a necessary element of every European aristocrat education, among the most famous, Montaigne 1580-81; Goethe 1786-87 IV, 285; Burger, 1825, IV, 11

**agrarian literature**, Onorati's list of recent books, III, 138

**agrarian literature**, thesis correspondence of agrarian wealth to freedom ages, Poggi, IV, 130-31; claim that agrarian prosperity triumphs when the new despotic rulers impose public order, Bertagnolli, VI, 206

**agrarian literature**, 17th cent. Italy, torpor century, I, 461; rhetoric pre-eminence on science, id., 462; Tanara, id., 465

**agrarian literature**, 17th cent. English school vigorous starting, II, 9-20; 72, 73

**agrarian literature**, 18th cent., Tull's theory echoes, II, 74-75; Duhamel, II, 162; III, 155; European Duhamel's standing, II, 162-163; prestige of Young's travel reports, III, 2-3

**agrarian literature**, 17th-19th cent. texts about wine, multiplicity, general mediocrity, Chaptal, III, 112-113, value of De Serres account, id., 113

**agrarian literature**, 18th century, Young's work: his illusions avowal, III, 8-9

**agrarian literature**, 18th cent., connection between vegetable physiology & mechanics, II, 86; the effort to imagine new cultivation procedures III, 19-20

**agrarian literature**, 18th cent., first Thaer's works, III, 182, 184; *Grundsätze* echoes, translations, id., 185-186

**agrarian literature**, 18th cent., the Encyclopédie influence: the Rozier's *Cours complet*, III, 80, 82

**agrarian literature**, 18th cent. increasing number of pages on history of agriculture & specific works about, III, 390; in 19th century number of monographies on the subject, VI, 193

**agrarian literature**, 18th cent., British publishing primacy, II, 99, 72; opposite characters of French & British schools, IV 85; in Italy agronomic work's modesty, vitality of agrarian economics & jurisprudence, II, 95, 211-212; continuity in works of first 19th cent. IV, 129

**agrarian literature**, 18th cent., philosophes' veneration for P. Leopold of Lorrein, IV, 129-30

**agrarian literature**, between 18th & 19th cent. the flourishing of pomological atlases III, 264; Italy 1817-39, project & realization Gallesio's *Pomona Italiana*, III, 264-265, questions about which was the complete project before author's death, id., 265

**agrarian literature**, 19th century, Tuscany agrarian events paradigm of all agriculture history, Poggi, IV, 130

**agrarian literature**, 19th cent., unceasing presence of literarian & ideologic inspiration, VI, 193

**agrarian literature**, 18th-19th cent., Neapolitan publishing liveliness, III, 129; IV, 333-34

**agrarian literature**, 19th cent. first essays on his history, III, 389-391; Dickson's treatise, id. 391-392; Lastrì's work, id. 392-393; Re's inventory, id. 394-396

**agrarian literature**, reasons proposed by De Gasparin for including economy in agronomical knowledge, IV, 156

**agrarian literature**, 19th cent. Italy, B. Pichat's *Istituzioni* mirror of Italian agronomy contradictions V, 83, the same Tanara's propensity for the metaphors, the same Re's rejection of all and every new science V, 87

**agrarian literature**, 19th cent. Italy, lasting prestige of Re works even if completely outdated, III, 300

**agrarian literature**, 19th cent. philolosophical role De Gasparin's *Cours*, IV, 157-162

**agrarian literature**, new 19th century horizons, the forerunners acknowledgment, De Gasparin, IV, 154; pre-eminent figures of European agrarian debate, IV, 19

**agrarian literature**, 19th cent., among genuine epistemological works, multiplicity of texts of literarian & ideologic inspiration, VI, 193

**agrarian literature**, historic pages in 18th cent. agronomic works, III, 390; in 19th cent. specific texts, VI, 193

**agrarian literature**, thesis correspondence agrarian wealth to freedom ages, Poggi, IV, 130-31; claim agrar. prosperity triumphs when the new despotic rulers impose public order, Bertagnolli, VI, 206

**agrarian literature**, Tuscany agrarian events paradigm of all agriculture history, Poggi, IV, 130

**agrarian literature**, 19th cent., Liebig's historical essays & polemic pamphlets, IV, 29, 34-39

**agrarian literature**, 19th cent., Italy, B. Pichat *Istituzioni*, odd repetition of an outdated design, V, 85-86, the "new" system of agrarian learning, id, 128-29, repeating Tanara's fanciful substitution of the objects to the disciplines, id., 88, the contradictions & the conflict with the publishers, id., 84-91

**agrarian literature**, 19th cent., Boussingault's essays & memorials, IV, 44

**agrarian literature**, 19th cent., age suggestions in Boussingault's title *Economie rurale*, IV, 45

**agrarian literature**, 19th cent., agrarian literature, the "contemporaneous" reading of Latin agronomists, Dickson, III, 391; in particular of Columella, Onorati, III, 141

**agrarian literature**, 19th cent., Bruni's *Nuova Enciclopedia* patchwork of plagiarised pages from major European agronomists skillfully aimed to vulgarisation, IV, 333

**agrarian literature**, 19th cent., Cantoni's *Trattato teorico pratico* modern agronomical treatise, V, 207, publishing circumstances, id. 211

**agrarian literature**, *Enciclopedia agraria* by Cantoni multi-discipline updating of Italian agronomic culture, V, 207-08, pre-eminence of natural sciences completed by architecture, mechanics, food transformation engineering, with an historical introduction, id, 208, contradictions of the achievements, id, 208

**agrarian literature**, 19th cent., olive and oil, Caruso's *Monografia* magisterial compendium on the subject, V, 226

**agrarian literature**, 19th century, Rosa's *Storia*, design vastity, composition flimsiness VI, 211-13

**agrarian literature**, 19th cent., Cuppari's work, the end of Tuscan school parabola, IV, 499, contribution to united Italy agronomic science, id. 397, the *Manuale dell' agricoltore* model of new professional handbook, IV, 365, will be improved in his successive works, id. 371; schema of farm factors composed as a matrix, id., 379-385-86; the imitation, Marconi, V, 253; prototype evolution in Niccoli's *Prontuario dell' agricoltore*, VI, 198

**agrarian literature**, 19th cent., first decades, German science's new ambitions, III, 180-182

**agrarian literature**, 19th century, Niccoli's work, inquiry on the capital events of main agriculture sectors & related texts inventory, VI, 196 - 221; subdivision of agrarian knowledge spheres, id., 220, work's barycenter into Antiquity & in economic-evaluation disciplines, underestimation of biologic & mechanical matters, id., 221, 19th cent. agronomy & its protagonists ignorance, id., 222, imaginary Italian agronomists primacy, especially in explaining photosynthesis process, without any knowledge for comparing their work to key texts of Agrarian Revolution, id, 222; late reposition Re's pseudoscience, id., 223

**agrarian literature**, suggestion to know, through Anderson's manual, English agronomy, Cantoni, V, 165

**agrarian literature**, 20th cent., apology of Crescenzi peripathetic science, Niccoli, Savastano, I, 210-13

**agrarian literature**, 20th cent., E. J. Russell, third Rothamsted director, publishes in 1912 *Soil conditions and plant growth*, the century's most complete manual of soil sciences, after the 1961 systematically updated by his son E. W., VII, 137-138, utilising experimen-

tal researches performed in the entire Commonwealth, id., 138; because of the progressive independence of the explored disciplines it will be the last organic compendium of agrarian sciences, id., 138

**agrarian literature**, 20th cent., the UTET *Nuova enciclopedia agraria italiana* expression of new structure of agrarian knowledge, VI, 195-96

agrarian literature, 15th-18th cent. Italy, the georgic poetry parabola, I, 22; id. 50; id. 233; id. 257-258; didactic poems 18th cent., II, 119-121; cultural purposes & metres, Pindemonte, id. 121-122

**agrarian literature**, beekeeping, review of mentions in classical literature, Niccoli, VI, 230

**agrarian literature**, 20th century, publication of Vavilov main texts, VII, 39

**agrarian politics**, 18th cent., scientific knowledge connection with economic & political development, II, 4-5; Muratori, id., 101-02; III, 76, id, 334-35

**agrarian politics**, fragmentation of land ownership, need of reordering, estate rules in communal statutes, Muratori, II 103, III, 389, latifundia, necessity of fragmentation & distribution in emphyteusis to peasant farmers, Muratori, II, 103-104, Church's old rights wise tutelage, id, 104

**agrarian politics**, inefficiency of State granaries, Muratori, II, 107; Duhamel, II, 275-76; Beccaria, id., 286

**agrarian politics**, differences among countries prosperity depending on farmer industriousness, Muratori, II, 100; depending on region fertility, Beccaria, id., 284-85

**agrarian politics**, benefits & drawbacks of a State grain trading regimen, at half 18th cent. the prologue of a European debate, II, 107; necessity of public rational intervention, Muratori, id., 107-108; Verri, id., 292-93; damages from allowing monopolies, Duhamel, id., 275, cautions for the best stored reserves preservation, id., 277, benefits of producers' supplies management, id., 277; emphasis on benefits of public management, in spite of his liberal faith, Bertagnolli VI, 209; wheat market, Pope's state, imaginary copy of Roman empire's wheat policy, Galiani, II, 284

**agrarian politics**, Muratori principles application in Modena duchy, II, 105

**agrarian politics**, Tuscany, Medici rule long season of agriculture decline, Poggi, IV, 142, feudal most prevaricative customs restoration, id., 142, the excise burden on agrarian economy, id., 142

**agrarian politics**, 18th century Tuscany P. Leopoldo of Lorraine reforms, ecclesiastic mortmain, corvées and trade ties abolition, ducal estates rules reformation, peasants access to communal councils, II 228; Poggi, IV, 143-4, all rents subjugation to land taxation, id., 144, grain market freedom, excises suppression, any new fideicommissum prohibition, rescission feudal jurisdiction, id., 145, the reforms prodigious effects, id., 145, new economic decline after P. Leopold reforms, because the plan was not perfectly completed, id. 146

**agrarian politics**, Tuscany, 19th century, sharecropping, original contract prevarication made it a hindrance to agrarian progress, Poggi, IV, 140-141

**agrarian politics**, food market policy, 17-18th cent. England, subsidies to wheat exports foundation bread cheapness, Young, II, 277-78, support to merchant navy, id., 278, independence bread cheapness from agrarian improvements, id., 279, confutation of any damage for national manufactures, id. 280-81; demonstration of wheat subsidies triflingness for British national wealth, Verri, id., 292-93, incentive to enlarge arables, id., 293-4

**agrarian politics**, Great Britain, 1793, foundation Board of agriculture, III, 3

**agrarian politics**, 18th cent. Great Britain, the option for the large estate, Young, III, 36-37; large farms role in supplying town-markets, Pitt, id. 38-39

**agrarian politics**, Great Britain, 1846, Corn Laws abrogation by Peel cabinet marks the beginning of landed aristocracy decline, VI, 178

**agrarian politics**, public land reclamation refusal by Thaer, because hiring journeymen the State would raise their wages, damaging landowners, III, 203

**agrarian politics**, 19th cent. end, while European countries develop agriculture founded on rotation/livestock econ., Italian rulers rely on fruit, wine production & typical foodstuffs, VII 20, belief in future increase of wine, oil, cheeses, preserves export to U S, id., 21.

**agrarian politics**, 19th cent. Italy, Church & communal estate auctions managed by government in favour of Mezzogiorno parasitic classes, Sonnino, V, 198, connected mistake abolition of emphyteusis, in a backward society a unique way to diffuse managing habits, id. 200

**agrarian politics**, Sicily, 1876 journey of Cavalieri, Sonnino, Franchetti, aiming to precede the conclusions of parliament enquiry on the illegality's dominion in the island, in the certainty that it would ignore the key links between aristocracy and delinquency, investigating the roots of crime in the countryside, V, 172-73, the preparation, the introduction letters, Cavalieri, id., 173, the agreement for precautions in every conversation, id., 173, the account writing, id., 174-75; the mafia "discovery", its origin in illegal continuity of abolished feudal order, Franchetti, id, 176, inability of both Bourbon and Savoia rulers to impose a state law dominion, id., 177, given the interest correspondence between landed nobility & mafia, id., 178, the sealing of links by mafia support to noblemen in parliament elections, id., 178, the common purpose of nobility & delinquency to preserve the region backwardness, Sonnino, id., 202, precariousness between peasant & land being the first misery's reason, necessity to diffuse sharecropping in Tuscan version, id., 192-93, proposal to build houses in the countryside & to diffuse arboreal cultivations in latifundia area, id., 193, the exemple of better peasant conditions in Messina sharecropping areas id., 197

**agrarian politics**, the Marxist illusion of middle 19th century that cereal market revolution would kindle a competition which foreshadows the struggle in which capitalism will destroy itself, Kautsky, VI, 163-65, triumph of "industrial latifundium" would compell peasants to starve id., 165, correspondence between Marx's economic prophecies & Liebig's predictions about soil sterilization by modern agriculture, id., 165, a collapse's proof potato diffusion, whose consumption would debilitate peasants, id., 165, fertility equally dissolved in capitalistic estates & peasant farms, id., 166, the only way to avoid soil depletion & workforce collapse would be public estates "scientifically" managed by state officials, id., 167; profecy renewal in pedological key, Haussmann, VII, 132-33

**agrarian politics**, 19th cent.; peasant opposition to any proposal of land collectivization, VI, 156-57; rural areas electoral weight, id., 157; parties competition for gaining peasant adhesion, VI, 168

**agrarian politics**, German Socialdemocracy program: option for low food prices aiming at peasant economy dissolution by international competition, Kautsky, VI, 168, peasant class support would delay public farming triumph, id., 169; to impose collective land management necessity to gain the consent of little tenants, who must recognize they are simple workers, id., 170; complementary tasks: abolition feudal privileges, peasant access to communal councils, id., 170, opposition to cooperatives & rural saving banks, which would delay the peasant world collapse, id., 171

**agrarian politics**, natural resources preservation, proving false Kautsky profecy, protection will by better, even if insufficient, in capitalistic than socialist countries, VI, 167

**agrarian press**, 18th cent. last decades, exaltation of technology achievements, which forestall science, III, 333-34; the press spreading kindles public enthusiasm , III, 333

**agrarian press**, 18-19th cent. Great Britain, identity between Young's claims & landlord pretensions, II, 278, III, 1, 5; allusions to his saleability, Stone, id. 6

**agrarian press**, 19th cent., the popularizer: experimenter, journalist, seller, V, 150-51

**agrarian press**, 19th cent. end, Ville's lectures vast echo, V, 152; wheat "industrial" production sensational announcement, id. 153; *Le Figaro* proclaims the manure's uselessness, Gautier, id. 157; Ottavi's opposition on Italian magazines, V, 159-61

**agrarian press**, 19th cent., Ottavi's almanacs complement to political & business lu-

cratie activities V, 163

**agrarian press**, Italy, cronology first farmer's magazines, Niccoli, VI, 236

**agrarian publishing**, 16-17th centuries, the role of Venice as capital of Italian printing, the number of agrarian texts, I, 272

**agrarian publishing**, 18-19th centuries, Florentine tradition of iconography of living beings, III, 264

**agrarian publishing**, 19th cent., Naples, works reprinted, publishers, readers, III, 129

**agrarian publishing**, 19th cent., in Pasteur's *Études sur le vin* first employment of colour printing for scientific illustration, V, 48, in his *Études sur la maladie des vers à soie* first images of microscope fields, id. 76

**agrarian publishing**, 19th cent., Italy, Cantoni's *Enciclopedia agraria* rejuvenate a culture motionless on Re's writings, V, 206

**agriculture's geography**, economic factors influencing single crops diffusion, De Gasparin, IV, 168, combination of different crops in agrarian regions, id., 168-69, supposed rigidity crops climatological limits

**agriculture's geography**, Africa, oases' fertility, Pliny, I, 128-29

**agriculture's geography**, Egypt, times & high Nile flood, Pliny, I, 129; 1959, project Aswan dam will increase for 1/4 national arable land, El-Helaly, VII, 76

**agriculture's geography**, China, food production/demand ratio, Fabbroni, III, 150; Duhalde in Malthus, id., 379, 381

**agriculture's geography**, Brabant & Flanders, 17th cent., English travelers reports, Weston's role, II, 9-10; 19th century, Von Schwerz's account, IV, 5

**agriculture's geography**, India, Sir Pereira, stated in 1988 that it was enough to observe from an airplane the brown colour of rivers to understand that overpopulation imposed poor practices of miserable peasants which were depleting the fertile layer of the whole subcontinent destining it to a future of famine

**agriculture's geography**, Australia, a continent with immense agrarian surfaces, whose cultivation is hindered by aridity and salinity, but whose sown area, 10 million ha of wheat & 3,5 barley is so ample that improving yields of 100 kg/ha would mean enormous increase of exports, M. Gilbert, VII 430

**agriculture's geography**, New Zealand, two islands devoted to cattle and sheep farming based on clover- regrass pastures dressed only with phosphorus, VII, 174

**agriculture's geography**, 1912 California, a specialist's report describing the growth of fruit cultivation in a country which is becoming the planet tytan in the sector, Molon, VII, 25, 34

**agriculture's geography**, El Salvador, soils peculiarities, white volcanic sands covered by black humus, Klinge, VII, 93

**agriculture's geography**, Italy, beginning 19th cent., marshy plains depopulation, overpopulation & overexploitation of hilly regions, everywhere peasant misery, Re III, 301-02, 316,

**agriculture's geography**, Bologna, province, beginning 19th cent., 3 areas, 3 soil types, 3 cultivation traditions, Re, III, 307, universal sharecropping diffusion, social mé-tayers inferiority, absolute journeymen precariousness, id., 313; in Po crossed regions marsh-fever diffusion, Baravelli, III, 314

**agriculture's geography**, Brescia territory, (Lombardy) XVI century, relationship among natural resource, population, cultivation intensivity, Gallo, I, 278-79; Sereni, id. 280

**agriculture's geography**, Brianza (parts of Milan & Como provinces), beginning 19th cent., arboriculture, maize, Capitani, III, 303, leasing of little parcels, misery of peasants conditions, id., 310-11

**agriculture's geography**, Cremona province, beginning 19th cent., intensive forage cultivation, flax, cereals, Bellò, III, 304, large farms tenancy, flourishing cattle breeding, Bignami, id., 311

**agriculture's geography**, Ferrara province, beginning 19th cent., dominion of uncontrolled waters, fertile *dossi* (ancient river-beds in relief upon the plain), Re, III, 308, tithe persistence, id., 315, use heavy ploughs for 8 oxen yokes, id., 319

**agriculture's geography**, Forlì province, beginning 19th cent., wheat predominance in fields with vine supporting tree rows, Re, III, 308, sharecropping universality, overdues load, id., 314

**agriculture's geography**, Friuli, beginning 19th cent., lack of any river control, frequent floods, miserableness of agriculture, Mazzucato, III, 306, land property fragmentation with survival of Middle Ages compulsory cycles, impossibility rational successions, id., 313

**agriculture's geography**, Lodi, beginning 19th cent., area characteristics, forages pre-eminence, maize, wheat, Bignami, III, 303, large tenancy, flourishing dairy industry, id., 303, diffusion Ladino white clover (*Trifolium repens*), id., 320

**agriculture's geography**, Marche, beginning 19th cent., Ancona, mountain slopes deterioration, coastal plains fertility, overpopulation, Miotti, III, 309; Macerata, oxen lack: spade substitutes plough, Re, III, 308

**agriculture's geography**, Mestre (Venice) territory, beginning 19th cent., soil poverty, peasants misery, Fappani, III, 305-306, nobility estate great landing, with sublease by middlemen to peasants, few sharecropping, polenta the unique peasant food, id., 312-13

**agriculture's geography**, Milan, beginning 19th cent., in suburbs amplitude of market gardening, Berra, III, 303

**agriculture's geography**, Reggio Emilia province, beginning 19th cent., forage cultivation & livestock farming intensity, Bolognini, III, 307, lucerne diffusion, id., 320

**agriculture's geography**, Verona province, beginning 19th century, eroded mountains, marshy plains, Re, III, 304, 280

**agriculture's geography**, Ravenna territory, beginning 19th century, fertile land, marshes proximity, Giovannelli, III, 308, population thinness extenuates sharecroppers competition for land, id., 315

**agriculture's geography**, Tuscany, 19th century, density of countryside population, cultivation intensity, IV, 60; conditions & crops variety, practices uniformity, Ridolfi, IV, 325, rural economy's decline forecast, id., 271; intensivity & backwardness connection, Cuppari, IV, 372, lack of fodder cultivation compels to buy marsh-forages and manures, id., 373; import of Swiss cows will impose forages cultivation, id., 377, Maremma, technical-economic account of a typical farm, Cuppari, IV, 390-91, extensive cultivation imposed by malaria, id., 392

**agriculture's geography**, Naples kingdom, single regions characteristics, agrarian products, Onorati, III, 139

**agriculture's geography**, Ercolaneum, on Vesuvius foothills, 19th cent., vineyard planting on lava rocks, Gagliardo, III, 310

**agriculture's geography**, Sicily, 19th cent., inland latifundia dominion: wheat-broad-beans succession & cattle untamed grazing, *gabellotto* (middleman) country life despot, V, 182, crops grown with the sole risk of the peasant tenant (or sharecropper) contracts analysis, Sonnino, V, 184-85, journeymen employment, id., 182, usury foundation relations between peasant & *gabellotto* & of huge economy, id., 187; on the coasts multiplicity arboreal cultivation & corresponding contracts, Sonnino, id., 188, cultivated species & agreements, id., 189-90, notwithstanding continuous labour need, work certainty on arboriculture areas is as volatile as in grain-latifundia, id., 192

**agriculture's geography**, Brittany, beginning 19th century, agriculture backwardness for rotations' irrationality, Young, III, 40

**agriculture's geography**, Normandy, the 20th century's end maize triumph in the land of milk from pasture, VII 372

**agriculture's geography**, Kent, soil characteristics, cultivation of heath expanses, Mortimer, II, 66

**agriculture's geography**, Oxfordshire, soil characteristics, cultivation practices,

Mortimer, II, 66

**agriculture's history**, land exploitation systems, definition, De Gasparin, IV, 225-26, relation with social systems, id., 227-28, 243-44, historical succession, id., 229; Celtic systems or roaming culture, id., 232-33; transient forms, the pond system, id., 233; the fallow cycle, id. 234-36, fallow economic balance, id., 234, comparison capital needed & popul. fed by different systems, id., 243-44, supposition individual freedom of choosing between different systems, id., 228; flimsiness of hypothesis, id., 228; Lecouteux, IV, 330; fallow system, its place in evolution man/land relationship, required capital, De Gasparin, IV, 233-34; forest system, felling reasons, id., 230; pasture system, id., 230; definition flimsiness, id., 228; pond system, fish & grains production alternation, id., 232-33, entity N collected during submersion, id. 233; grain production system based on market fertilizers, id., 236-38

**agriculture's history**, natural & economic factors influencing single crops diffusion, De Gasparin, IV, 168, combination of different crops in agrarian regions, id., 168-  
**agriculture's history**, vegetable & animal spp. in Mediterranean civilisations, Hehn, VI, 4; theory of human races spreading together with botanic & zoological spp., id, 4; tamed animal & vegetable genomes diffusion together with human ones by Neolithic migrations, Cavalli Sforza, VII, 330

**agriculture's history**, in Italy, a country of marsh-plains, land reclamation started with Etruscans, Bertagnolli, VI, 200, pursued with communal projects, id., 207-09, which were followed by those of ducal authorities, id., 208 till the immense works on the Po delta started at half 19th cent. by Ferrara Papal governor and performed by the new kingdom at the end of the century, VI, 233

**agriculture's history**, Greek Calabria, agriculture sketch from Eraclea tables, Bertagnolli, VI, 202

**agriculture's history**, Greek Sicily, wheat of cultivation for slaves abundance, Bertagnolli, VI, 201, conversion in wheat expanse after Roman conquest, id. 201

**agriculture's history**, Etruria, agrarian prosperity supported by trade vitality, Bertagnolli, VI, 199-200, region wealth continues after Roman conquest, id., 201, denial thesis agriculture collapse during late Republic, id. 201

**agriculture's history**, Rome, economy founded upon conquest, not on agriculture as claimed by old historians, Bertagnolli, VI, 202-03; three Roman agricul. phases: cereals, vine - olive, slave-operated villa, id., 203-04, rejection thesis agriculture's fall at empire origins, id., 204; new freedom condition in barbarian societies, Poggi, IV, 131, decline in feudal regime torpor, id., 131

**agriculture's history**, Rome, agrarian laws, formally responsible of *ager publicus* management, patricians appropriate it, Poggi, IV, 134, land avidity condemns Republic, id. 134-135, analysis *colonia* contract, the general means of *ager publicus* usurpation, id, 134

**agriculture's history**, Rome, peasants conditions, the two classes from Caracalla edict were differentiate in a plurality of castes & peasant ranks, Poggi, IV, 137, the barbaric laws acquire soil serfdom, id. 138

**agriculture's history**, Rome, empire, economy, future decline symptoms, Columella, I, 64; the emperors sacrifice general wealth to army's needs, Poggi, IV, 136-377

**agriculture history**, Rome, to pay the army the treasury suffocates economy, which Dioclezian brings backs to barter, Poggi, IV, 137

**agriculture's history**, Italy, informations about single crops introduction, Niccoli, VI, 231, flimsiness data about forage crops and fruit species with some rare remarks, id., 231

**agriculture's history**, Middle Ages, hindrances to agriculture productivity from warfare continuity, Muratori, III, 389; Longobard personal freedom's corruption in Latin framework, Poggi, IV, 138; family-farm selfsufficient body, exiguity of exchanges on the market, Kautsky, VI, 158; community's resources exploitation, subjection to cultivation imposed by consuetudinary law, id., 159, system stiffness prevents adjustments to market demands, id., 160; agricult. decline would start from imposition to feudal lords to

leave the castle for living into the town, Bertagnolli, VI, 205; Italian communes abolish serf tie to the soil to take possession of rural economy, Poggi, IV, 140; claim of ideal significance of communal decision, Rosa, VI, 213; agrarian prosperity flourishes when seigneurie stops communal democracy's perpetual struggles, Bertagnolli, VI, 206

**agriculture's history**, Middle Ages, emphyteusis role in re-establishing land cultivation in the wastes left by invasions, Bertagnolli, VI, 205

**agriculture's history**, Middle Ages, irrigation triumph bore from substitution of communitarian German right to Quiritarian one, Bertagnolli, VI, 207; juridical matrix of Italian irrigation: the fallacious explication by Cattaneo & Einaudi, VI, 207-08

agriculture's history, 16th cent., development in Lombardy, Flanders, Rhine valley, South England, II,2; Lombardy & Flanders analogous pre-eminence in animal husbandry, I, 295-96

**agriculture's history**, 14th century onwards, Lombardy irrigation increases food availability, I, 214, multiplication products to be submitted to manipulation proof of intensification of agrarian economy, I, 280

**agriculture's history**, 15th century Spain, Moorish agriculture achievements, Herrera, I, 219

**agriculture's history**, 16th cent. England, paean of land under individual power, Tusser, I, 269-70; declaimed commons sterility, Tusser, id., 269; Bloch, id. 266; succession Parliament acts, Van Bath, III, 33; economic & social benefits of enclosures, Young, id., 33-35, fancied impulse to population growth, id. 35; demonstration of countryside depopulation, More, III, 35-36

**agriculture's history**, commons expropriation supposed product of "bourgeois" 1688 Revolution, landlords rent land to capitalistic entrepreneurs, Kautsky, VI, 160

**agriculture's history**, 18th cent. Lombardy, cattle breeding living economy, Young's appreciation, III, 61-62

**agriculture's history**, 18th. cent., Roman agriculture claimed as the most advanced in history, Onorati, III, 140; Dickson, id., 391

**agriculture's history**, India, British Empire rules Globe's largest agrarian estate, entrusting *zimandar* (middlemen) class with the exploitation of *rayat*, miserable peasants, who thanks to millenary procedures obtain relatively high production, Kumar, VII, 438; following national habits some British officials found scientific & agrarian societies, 1830 Agricultural and Horticultural Calcutta Soc., which aims to create a Cattle Breeding Farm, never funded by imperial officials., all the projects reveal vain efforts being anti-thetic to opium preeminence established by imperial rulers, id., 439; 1860 Manchester cotton manufactures pretend their raw material production be improved, but imperial authorities refuse innovations that could compromise opium business, id, 440; even enlargement of tea production managed with sluggishness, id., 440; 1890 London send to India A. Voelcker, authoritative agronomist & chemist, who presides over successive conferences for the foundation of agrarian colleges which conclude without any result, the first true agronomical institution being created in 1905 in Pusa by the funds of an American philanthropist, id., 441, after independence population growth imposes soils overexploitation, with erosion worsening, that condemns India, foresees Pereira, to a future of famine, id., 447

**agriculture's history**, Ireland, advantages, to expell tenant peasants to convert arable into pasture, De Gasparin, IV, 228

communal land, old pasture right abolition imposes **catle** stalling, drawbacks, Thaer, III, 227-28

**agriculture's history**, Lombardy, 18th cent., cattle breeding practices & economy, Young's appreciation, III, 61-62

**agriculture's history**, Modena, duchy, beginning 19th cent., sharecroppers' cattle half-property, Re, III, 313

**agriculture's history**, 19th cent. beginning, agrarian knowledge, after some decades of lively improving acquiring all natural sciences' results one records a period of leth-



argy, exemplified by Re aversion for every new science, III 292-94

**agriculture's history**, beginning 19th cent. Italy, under French rule questionnaire to sketch the agrarian profile of every province, Re, III, 299

**agriculture's history**, Maremma (Tuscany), increase of cereal area during Napoleon wars, then reduction, Ridolfi, IV, 262

**agriculture's history**, 19th century Tuscany, Val di Nievole, technical-economic account of typical sharecropping farm, Cuppari, IV, 388-90

**agriculture's history**, 19th cent Italy, identification of strenght & weakness points of national agriculture, Cuppari, IV, 394-96, undervaluation of potential large marshy plains to be reclaimed, id. 395, foresight about the opportunity of fruit-tree cultivation, id., 395; attitudes of Italian environment for arboriculture & gardening, Roda, V, 224

**agriculture's history**, Great Britain, Agrarian Revolution cradle, retains its primacy till 1880, Galanti, VI, 177, then industrial interests prevail for Corn Laws effects favorising imports & kindling agriculture decline, Giglioli, VI, 178

**agriculture's history**, 1893 US, differences from Europe's land exploitation, Gilbert, VI, 92-92

**agriculture's history**, Green Revolution, Mexico, 1948, distribution maizes crossed following Wellhausen method, Conway, VII, 113, 1949, distribut. first Borlaug wheats, id., 114, identification wheats able to utilize water & nitrigen, the next Borlaug creastures, id. 114, the traits combination which make them "new" plants, id., 115; 1965 India buys Mexican seeds, id. 116, 1968 Philippines & Pakistan, id., 117, 1964 Chile, id., 119, Turkey, Egypt, id., 119, China, Borlaug wheats & hybrid rices from Philippines, id., 119

agriculture history, Green Revolution, Philippines, 1960, IRRI foundation, VII, 118, 1966, selecion of IR8, id., 118, the "trial package", id., 118; Indonesia, rice cultivationj subsidies & yeld increase, id., 121

**agriculture's history**, Green Revolution, criticism: the nebulous galaxy which con- tests scientific agriculture proposing models of various suggestion & foundation has made the G. R. the preferred target, all the objections, having a sense or no one, were composed by Altieri in *Agroecology*, an anthology of lucubrations about the disasters produced by seeds born in Mexico, whose diffusion would have spread misery & fam- ine. Unfortunately a thousand proofs of local failure cannot deny that China & India numbered, at the down of that diffusion, 1 billion people together, living respectively with 1,636 and 2,073 calories p.c./d and that at the millenium end the two countries count 3 billion inhabitants living, respesively, with 2,972 & 2,466 calories/d., as incor- rect the official data may be, the divarication between the number couples proves the enormous contribution of the process to feed the planet, VII, 404

**agriculture's history**, Green Revolution, financial problems for new inputs (gasoline, fertilizers) VII, 120-21

**agriculture's history**, Green Revolution, Indonesia, subsidies to rice production, benefits, VII., 119, & drawbacks, id., 121

**agriculture origins**, hypotheses, Varro, I, 41; Lucretius, id. 49; first suppositions based on archaeological discoveries, Niccoli, VI, 223-25; absolute impossibility to forsee results of first seeding for lack of previous experience, Bronson, VII, 261

**agriculture origins**, Eurasia, simultaneous presence of domesticated animals & wild progenitors, *Psalms*, I, 14; Varro, id, 41; in Mesopotamia large presence species ready to domestication, id. 4; analysis possible reasons (at time) to identify progenitors of culti- vated plants, Darwin, V, 114; research centres of first domestication, first 8 proposed by Vavilov, VII, 50; Childe's climatic theorem, id., 231; at the end II World War beginning archaeological inquiries in Fertile Crescent, first supposed cradle of agriculture and first terrain of research, whose results were discussed at first congress about the subject in London in 1969, id. 231-232; proofs of changes in climate: 14.000 b.p., warming produced dilatation of Mediterranean evergreen forest, which in 10.000 b. p. covers Mesopotamic hillsides, rain did not exceed 250 mm/yr, in Jericho, the first settlement of Neolithic, even

inferior, Van Zeist, id. 232-233; second meeting to discuss data & theoretical hypotheses in Woodstock (US) 1973, deep disagreement on theoretical hypotheses founded on abstract postulates, id., 249-259; large consensus on the recognition that agriculture's birth should have required number of positive preconditions, analysed for the first time in a camp-discussion by the team engaged in Jarmo diggings and formulated independently by Braidwood & Reed, id, 270, consensus about concepts of adaptive plateau and treshold level, id. 271; results of 15 years more of research discussed at Southampton in 1986, id. 317, approved sequence which attributes to Natufian hunter-gatherers wild grain reaping and true cultivation to preceramic Neolith. stations, essay to define time first cultiv. with escav. at Abu Hureyra (Syria) examining differences in veget. remains in layers between 9.200 & 6.000 b. C., primarily the comparison in numbers cultivated grains & weed caryopses, statistical analysis would prove association of edible seeds with prairie wild plants in Paleolith. layers, with typical weeds in Neolithic layers, Hillman, Harris, id. 318-320, results will be denied and contradicted by same authors after successive laboratory analysis placing origins of cultivation in Paleolithic strata, id. 320; in the three main agricult. birthplaces still uncertain progenitors of numerous Central Am. species and some from F. Crescent, better known those of Africa, Harlan, id. 325-326; syntesis results 50 years of inquiries on the subject in a new London 1993 meeting, called to celebrate first Vavilov intuitions, starting point of all the discoveries thence, Harris, id. 329-330, geography origins agric. from 8 first Vavilov centres to 3, with 3 subcentres, proposed by Harlan in 1971, id., 329

**agriculture origins**, Levant, after the drying up which followed the end of Pleistocene, Neolithic Revolution produces societies with multiplicity of functions and duties, Childe, VII, 231; proofs of drying up supposed by Childe are not sufficient and definitive, but changes in climate between Pleist. & Oloc., placed at 14,000 b.p., explains these in flora and diffusion of wheat progenitors, Bottema, Van Zeist, id. 232; as a radical innovation in living standards agricult. diffusion imposes to postulate only one event of creation all over the planet, Carter, id. 257; even if somehow modified, climatic theorem for the origins of agriculture should be considered valid, Wright, id. 258; some participant in Newhampton meeting claims it would be trifling to engage in discovering the reasons of the birth of agriculture, as science would be interested only in diffusion, not in origin, of human discoveries, Wagner, id., 259; someone repropose Childe theorem claiming that changing climate would have produced the stress necessary to compel groups of hunter-gatherers to abandon old relations with resources in search of new equilibria, Harris, id., 262; confirmation sequence proposed by Bottema & Van Zeist, change of Pleistocene climate 13.000 B C favours new consociation based on oak & pistachio with *Rosaceae* & cereals, to climb from Mediterr. coasts till Zagros plateaus, which reaches between 7.000 and 5.000 a. C., Hillman, id. 336, amongst herbaceous flora prevails *T. boeoticum*, with wild barley and ray as part of the cenosis, herbaceous plants would have preceeded arboreal ones, whose diffusion is slower, impossibility to distinguish cereals pollen, that of wheats being identical to that of prairie Gramineae, makes it impossible to ascertain the order of colonization of different strains, whilst cold steppe did not lack of edible species, new consociation stimulate harvesting and quantities collected impose sedentarity near a silo, essays of sowing would have been made to thicken the crop canopy, id., 366; vastitude F. Crescent imposes the question if cultivat. eingingrain, emmer, barley, pea, lentil & chick-pea were each produced by one only event of domestication or by a multiplicity in different regions, genetics procedures not yet employed to solve the problem, being all autogamous spp. one can presume in the vast area a plurality of subspecies to be mated, but genome analysis show that with the only exception of barley all of the spp. cultivated in the F. Crescent are product of only one case of domestication, and given the complexity of every genome, the probabilities of a plurality of a mutation of the same singular trait are arithmetically exiguous, Zohary, id. 337-339; To the change in climate on Mesopotamy valleys would have corresponded a millennial vacuum of human settlement.: after Zarzian Paleolith. culture lasting from 22.000 to 14.000 b. p., only at 13.000

b.p., in corresp. to final Dryas, a cold period, archaeologist discovered first villages of preceram. Neolithic with round huts and an econ. based on wild cereals, fruit foraging and large exploitation of sheep and goats which paleontology cannot define nor wild nor semidomest.; on the relationship of protoneolithic societies with the animals that were a staple of their food procurement only conjectures are possible, Hole, id. 340-41; a research made about affinities of cultiv. wheats' genoma and those of wild progenitors in different regions of F. Crescent, and today varieties of the same species, with the comparison of 288 loci of *T. boeoticum*, 204 of *T. dicoccoides*, 400 of *Hordeum vulgare*, shows major similarities wheats of recent millennia with progenitors of Karcadag mounts, a chain separating the Tigris & Euphrates valleys, for barley a major genetical similarity with all posterior varieties is to be recognised in spontaneous ecotypes of Jordan, these results appear to bear out hypotheses of unicity of domesticat. events for every species in the area amongst Mediterr., Caspian Sea & Iran Plateau, Salamini et al.id., 349-50

**agriculture origins**, Levant, cultivation. & animal tending would have been developed in a scenario of a broad spectrum economy, which in Mesolithic replaced big game hunting with fowl, rodents & molluscs, plus foraging of seeds & acorns, for the conservation of which settled caves show appropriate silos, at the end of Pleistocene prairies of wild cereals would have colonized Mesopotamic hillsides till Anatolian heighs, agriculture would not be born amongst spontaneous cereal fields, but where cereals must be planted by man, like in Khuzistan; broad spectrum economy, a rational system for exploiting a multiplicity of resources, protracts itself in first agrarian settlements, at Ali Kosh (Khūzestān, Iran) villagers utilize 5 food procurement: cereal cultivat., animal husb., hunting of quadrap., of birds, collecting of wild legumes, Flannery, VII, 237-39

**agriculture origins**, hypotheses based on spread of agric. economy from centres of protocultivation, hypotheses of multicentred autonomous poles incapable of explaining entity of economic mutation, Harris, VII, 329-330; thesis migration of agrarian groups confirmed by analysis of "main components" of genoma of Europ. population, which proves 4 successive events of migrations producing genetical drift, the first attributable to agricult. spread, Cavalli Sforza, id. 330-331, opposition by Thomas to Cavalli Sforza thesis, confirmed by Piggott, id. 331; proof of conflict betw. migrant agricult. people and local hunter-gatherers at Stentinello, Sicily, Saltini, id., 332-333; routes of protofarmer migrational streams correspond to those of protolanguages diffusion; glottologists place the birthland of 4 fundamental protolanguages throughout Mediterr., Caucasus, Caspian and Red Sea, 3 diffused by migrations of agric. peoples, 1 by Indo-European shepherds, Euro-Asian languages spreading from F. Crescent had the same pattern of that of Mongolian languages diffusing from South China, birthplace of rice-based agriculture, Renfrew, id. 334

**agriculture origins**, India, lack of any paleobotanic & paleontologic analysis in excavations made by Indian archaeologists makes it impossible to trace reliable hypotheses. The only sure data from in Indus plain collected by Costantini at Merghar settlement, where in successive occupations between 8.000 & 4.000 b. C. villages staple are in succession semi-wild naked barley, *T. monococcum*, *T. turgidum*, *T. durum*, then *T. sphaerococcum* e *T. compactum*; in 3d millennium B C tame spp. assortment is the same as in Indus Harappa civilisation, which in 2d millennium changes radically adopting summer spp. of Chinese origin, rice and *Setariae*, with a methamorphosis from **rabi** cultivation to *kharif* cultiv. (in Indian summer or winter crops), goats appear domesticated, sheep still wild, even diminishing their body dimensions, Costantini data, published in 1981, prove the use of irrigation, Meadow, VII, 343-345

**agriculture, origins**, India, non-existence, in 1973, of proofs of agricult. before 4.000 b. p., when protocultivators arrived from Levant with cultiv. species typical of their birthplace, 1.000 y. later agric. started in China, Reed, VII, 272

**agriculture, origins**, Kara Kum (Turkmenistan), the desert which Vavilov gave different collocations in his successive geographies of Asia crops progenitors, Tell Jeitum revealed 3 occupation phases, starting, respectively, 5,500, 5,370, 5,050 b. C., economy

based on cultiv. *Tr. monococcum*, barley, emmer, exaploid wheats, sheep and goats herding & hunting, as annual rain is insufficient, members of the mission proposed different answer to the question how water was provided to crops, Harris, Gosden, VII, 342-43

agriculture origins, Mexico, at around 7,000 b.p. hunter-gatherers attended teosinte & setaria tufts, but metamorphosis of first plant was very slow and first agricult. settlements would presumably date at 3,500 b.p., exiguous number of domesticable plants & animals would have imposed a delay of 7,000 y. in comparison to F. Crescent, Reed, VII, 272-74

**agriculture, origins**, North China, in loess region, comprising Shensi, Shansi, Honan & Hopei, Neolith. culture of Yang-shao created from 5895 b. p. agricult. based on *Setaria* & *Panicum*, Ping-ti Ho 1977, VII, 251; about fertility Chinese loess, Pumpelly, id. 251; rice followed the 2 plants in late Neolith., wheat, barley and soybean would be imported in historical times, Ping-ti Ho, id. 252, from his birth Chinese agric. was completely extraneous from animal husbandry, in Yang-shao stations only traces of a presence of pig, horse, bovids, id. 253, starting water control for irrigation supposed at 100 a. D., id, 253; absolute absence, till 1973, of any reliable hypothesis about origin of rice-based agric. for lack of archaeological inquiry at the south of Yangtze, the area rationally candidate to be recognised as rice birthplace, Reed, id., 272

**agriculture, origins**, Palestine, between 19,000 & 18,000 b. p. Kebaran hunter-gatherers occupy hilly Mediterr. coast, 14,500-12,500 b. p. average rain increases multiplying resources, exploitable areas enlarge and new groups settle coming from Nile delta, social organization rests on little groups, new change in climate, with a decrease of rain, reduces again exploitable areas, and settlem. are concentrated near the coast, at the end Pleistoc. late Natufian culture establishes large villages thanks to ample dilation of wild cereals fields until a new aridity period, from 10,500 to 10,000 b. p. imposes to the same villagers the cultiv. of barley and legumes, Bar-Yosef, Kislev, 1986, VII, 323-24, this hypothesis connects apparently contradictory facts of climatic change & demographic growth basing agricult. birth on cultivation of barley notwithstanding proved diffusion *T. dicocoides* in the region, id, 324

**agriculture, origins**, Cambodia, uncertainty adoption agricult. in Neolithic layers of Noabinh, Higham, VII, 250-251

**agriculture, origins**, claim that traditions of farmers scatterig the seed on the prepared earth and those planting every seed with a stick produce different genetic results, the former preserving seed dimensins, the latter selecting larger seeds wich became a typical trait of a species: the former practice characterises the Levant, Ethiopia & China, the latter Mesoamerica & Niger region (sorghum-millet civilisations), Harris, VII, 263-64; posing the question if every and each domesticated plant originated in one only vil-lage or in many, Zohary observes that the most advanced genetic tools have not yet been used in detecting original parental relationships, but the genetical work to improve crops has offered large evidence useful to the purpose, id. 337, all of the F. Crescent cereals are selfpollinating, a characteristic which helped first cultivators to keep new traits, but selfpollination allows for exceptions, so that first domestic grains could undergo crossing with progenitors, offering new strains to be cheked by cultivators in search for useful characteristics, id., 339

**agriculture, origins**, Peru, results campaign Mac Neish in Huarochiri Valley, Callejón de Huaylas, Huánuco on both sides of the Cordilleira, taking into considerat. every settlem. placed between 22.000 e 3.000 b. p., aiming to connect contemporary camps and to define annual journey to exploit different resources in different locations, from this typical foraging economy agriculture emerges during the facies Piki in the region of Ayacucho, 7,800- 6,550 b.p., when settlem. are disposed at the centre of micro-areas with different potentials, whose resources may be reached with a short journey, at the centre of the plurality of resources permanent staying favourises the cultiv. of plants previously utilised at different stages of annual tour, Mac Neish, 1977, VII, 254, supposit. exchange know-how among settlem. in different areas at comparable stages of evolution id. 255

**agriculture, origins**, South America, in Ecuador settlements found where maize was first staple before than in Mexico, where plant originated, Reed, VII,274; identity orig. stock veg. spp. Mexico & Peru imposes quest. one or two indep. domestic. maize, beans, pepper, tomato, Pickersgill, id., 326, in maize absence eterocrom. knots in Peru varieties proves migration before first cultivars could cross with teosinte, which doesn't exist in South. Am., id. 327, for pepper 4 spp. suggest independ. domestic. in Mexico & Amaz. basin the two chenopods cultivated in Americas must be supposed independent, the 3 strains of cultiv. cotton, all tetraploid, had supposedly a common progenitor, id. 328, even selecting new varieties, Am. protocultiv. never created new species, id, 328; maize evolution in Mexico a difficult phenomenon to explain, because spontaneous crossing back with teosinte growing all around fields should have frustrated every effort to stabilise useful mutants, Wilkes, id. 328

**agriculture, origins**, South China, Asia insul., first excav. Yangtze low valley & delta in 1989 identif. Neolith. settlem. Hangzou bay & Taihu lake based on rice cult., either of Indica as of Japonica shape, water-buffalo & pig breeding, facies succession between 5.000 & 3.300 b. C., at last facies appears stone plough-share, rice supposed to have reached 3.000 years later Yellow River, where staple of previous neolith. soc. were millet & panic-grass, Zhao, Wu, VII, 345-46; Blust states rice diffusion followed 2 major directions & many minor branches, which correspond to diffusion pathways of Asian protolanguages as fixed by linguistic geography of Benedict, an alternative hypothesis was proposed with 2 centres of rice & protolanguages diffusion: Yangtze valley and tropical South-east, both hypotheses agree that rice diffusion would have started at the end 3th millennium b. C., Higham, Glover, id. 346, in Mekong valley wild rice remains in caves settled during Paleolith., in insular Asia a migratory branch would have changed, in equator. climate, rice for tuberous crops., migrants in Philipp. & Indonesia would have adapted rice cultiv. to local environm. creating terraces systems, it would still be hypothetical the time of introd. rice in India, id., 347

**agriculture, origins**, the Antilles, 1493, exceptional popul. density for a Neolithic soc. whose staple was manioc, dubiousness proofs of cult. different edible roots species, Sturtevant, VII, 243-44

**agriculture, origins**, Western Iran, between 8.500 & 5.500 b. C. large utilisation of wild wheat, with first experiences to domesticate plants, sheep and goats; favourable conditions induce popul. growth, compelling exorbitant fraction to emigrate in less favourable areas, as alluvial plains, where lack of spontan. grains would induce innovation, with develop. of large villages which in 3000 became true towns, Flannery, VII, 237; from regions first agric, as Kurdistan & Luristan, excess popul. would have expanded in Khuzistan, where agric. would be possible only with irrigation, innovat. would have proved so productive that between 5.500 and 4.000 previously sterile steppe would have allowed a popul. density higher than in old Mesopotamian foothills, from 0,1 ab/kmq of late Paleolithic popul. density would have reached 1-2 in dry agricult. areas, 6 in the irrigated ones, id., 238-39

**agriculture's philosophy**, the reason of the harsh man's struggle against famine, the God's curse of land and man's condemnation to pay bread with the sweat of his forehead, *Genesis*, I, 2; the man's struggle with hunger, Hesiod, I, 22-23; a corollary of human sorrow, id, 23, Virgil, I, 54

**agriculture's philosophy**, ideality of moral value of country life, Alamanni, I, 236; Gallo, I, 276-277; Heresbach, I, 350; Muratori, II, 100; Rosa, VI, 213-14; the myth of princes' passion for cultivation, I, 127; Pliny, I, 128; the pean for peasant-legionnaires at the Rome's origins, Poggi, IV, 134-35

**agriculture's philosophy**, 14th cent., agronomy foundation on peripathetic doctrine, I, 196-97

**agriculture's philosophy**, 18th century moral & political English philosophy's echoes in Italian agrarian texts, III, 151;

**agriculture's philosophy**, land exploitation and civilisation development driven by a providential impulse, Vico's echo, Onorati, III, 138

**agriculture's philosophy**, agrarian knowledge, idealistic distinction among practical knowledge, art & science, Thaer, III, 186; praise of practical know-how, Duhamel, II, 197, 206, Ridolfi, IV, 323, peasant's meticulousness foundation of intensiveness, not of rentability, id. 270; a scientific perception in many agriculture practices followed from centuries, Pasteur, V, 42-43

**agriculture's philosophy**, agronomy's connection to natural sciences, Thaer, III, 186-87; to mathematics, id., 188; to physics & chemistry, De Gasparin, IV, 156

**agriculture's philosophy**, agrarian knowledge, idealistic distinction among practical knowledge, art & science, Thaer, III, 186; praise of practical understanding, Duhamel, II, 197, 206, Ridolfi, IV, 323, peasant's meticulousness foundation of intensiveness, not of rentability, id. 270; a scientific perception in many agric. practices followed from centuries, Pasteur, V, 42-43

**agriculture's philosophy**, Positivism claims economics must follow in mechanics' steps, De Gasparin, IV, 153, refoundation agronomy on the chemical-biological base of nitrogen cycle, id., 159, proposal's significance in Comte & Marx age, id. 161-62,

**agriculture's philosophy**, dignity of country worker, effect substitution human energy by machines, Aug. de Gasparin, IV, 185

**agriculture's philosophy**, hypotheses of cultivation's future, forecast of an age when chemistry would satisfy any food demand, and agriculture would offer spaces and panoramas for leisure, Niccoli, VI, 228-229

**agriculture produce industries**, Columella, I, 62; exclusion from agrarian knowledge, De Gasparin, IV, 157-58; middle 19th cent., shifting from farm manipulation to urban manufactures, V, 289, demographic, economic, technological conditions for the process, id. 29

**agriculture produce industries, cereals**, Pliny, I, 142-44; bread, know-how for making, De Serres, I, 426-27; Duhamel, II, 173-174; Mitterpacher, III, 52

**agriculture produce industries, cereals**, weath fecula, processing, Pliny, I, 144, semolina from durum wheat, identification with *alica*, I, 144; production process, Pliny, id., 144, starch production, id. 144, bread yeast drawn by must, Pliny, I, 144, drawn by beer, id., 144; Heresbach, id., 358

**agriculture produce industries, cereals**, 19th century, flour multiplicity types offered on industrial town market, Laffon, V, 299; inquiry on chemical flour characteristics for best bread-making, Larose, VII, 79; traditional kneading practice, new industrial procedures, Laffon, V, 300, expedients for yeast conservation, id. 300, bread's succedanea, biscuit, sea-biscuit, Italian bread-stick id. 300, kneading machines offered by mechanical manufactures, id. 301, industrial kneading with a part of bran for Paris charitable institution, id. 301, kneading with CO<sub>2</sub> saturate water to reduce fermentation losses, id., 302, conservation, mould damages, id. 302

**agriculture produce industries, cereals**, at end of 19th century international market offers number of cereal varieties, Laffon, V, 299, diffusion adulteration, id., 299, chemists' engagement to experiment methods to prove flaws in the merchandise, id., 300, tests evaluation of technological characteristics, microscopic examination to detect mixtures with amylaceous cheaper substances, id., 300, first analysis instruments, id. 300, flour adulteration, essay with sodium hydroxide & iodine solution, id., 301

**agriculture produce industries, starch from potato**, procedure & plants, Besana, V, 315

**agriculture produce industries, preserved foodstuffs**, place in 16th cent. economy, De Serres, I, 426-28; 19th century, in the new industrial scenario, V, 395-96

**agriculture produce industries, perishable foodstuffs**, from Spallanzani's experiments Appert conceives a preservation method, Pasteur, V, 29, role Pasteur's experiments for foodstuffs sterilisation, V, 33, 48-49, VI, 43; industrial application, Besana, V, 308-12

**agriculture produce industries, preserved meat**, times & expedients at slaughtering season, De Serres, I, 427; pork sausages, Tanara, I, 474

**agriculture produce industries, preserved meat**, middle 19th cent., demand expansion, research of means for preservation & haulage, V, 305-06; salting & drying, exiccation, salting in vacuum, cold use, antiseptic compounds, Besana, V, 309-11, refrigerated-hold ships, 1873 from Australia, 1876 from Argentina, id, 310, Cirio's method, id. 311, Liebig's beef extract patent, id. 311

**agrariculture produce industries, dairy**, cares to be applied in milking, Amoretti, III, 71

**agrariculture produce industries, dairy**, milk curdling, Columella, I, 118-19; 16th cent. Po Valley, Gallo, id., 329-30; France, De Serres, id., 393, 395

**agrariculture produce industries, dairy**, 16th century, differences in milk manipulation depending on seasons, Gallo, I, 329; De Serres, I, 393

**agrariculture produce industries, dairy**, 16th cent. *Piacentini & Lodesani* cheeses, Lombardy variants, Gallo, I, 323-24; 18th cent. Lombardy Padano cheese, heat management, Lavazzeri, III, 72; introduction in the hoop and salting, Gallo, I, 329-30; Lavazzeri, III, 72; Bruni, IV, 349; peculiar qualities & market troubles, Besana, V, 304-05; Parmesan history & economy, famous amateurs, Niccoli, VI, 247; Switzerland, Po Valley's cheese imitation, De Serres, I, 392

**agrariculture produce industries, dairy**, expedients for the best cheese ageing, Gallo, I, 330; De Serres, id., 395; Amoretti, III, 73

**agrariculture produce industries, dairy**, 16th century France, wealth cheese gamut, from cow, sheep, goat's milk, De Serres, I, 394-95, different qualities depending on fat content, id., 395; Brie cheese, production procedure, La Bretonnerie, III, 106

**agrariculture produce industries, dairy**, 18th century, a imaginary poisonous cheese because of hellebore grazing, T. Tozzetti, II, 216; impossibility of milk secretion by a poisoned female, Westrub, IV, 3

**agrariculture produce industries, dairy**, butter, seasons for an higher standard product, Gallo, I, 329; cropping up & curdling, De Serres, id., 393-94, production seasons, id., 394, procedure for long conservation, id., 395; product from whey filtration, procedure, id., 395, milk skimming after mixing morning milk with that of previous afternoon, Lavazzeri, III, 72; fresh milk globule shape, how cropping up, Boussingault, IV, 69; process to clarify (by melting) the butter, adulterations, compounds used in adulteration, impossibility of chemical assessment for lack of chemical basic notions, A. Cattaneo, IV, 353; first endeavours to discover the fraud, id., 54; conservation, Appert process, id., 350, use of Gauthier press, id., 351; Besana, V, 303-04

**agrariculture produce industries, dairy**, process for producing *stracchini* [soft cheeses], id., 74; A. Cattaneo, IV, 348-52

**agrariculture produce industries, dairy**, 19th cent. France, cheese classification depending on production process, Masson F., A. Cattaneo, IV, 351-52

**agrariculture produce industries, dairy**, 19th cent. Germany, cheeses classification depending on fat, milk acidity, compression degree, Thaer, III, 219-20

**agrariculture produce industries, dairy**, 19th cent. machines & tools, Besana, V, 303

**agrariculture produce industries, dairy**, buttermilk curd, how to make, De Serres, I, 395; Bruni, IV, 350

**agrariculture produce industries, dairy**, cheese, agrariculture produce industries, dairy, churn forms & handling procedures, Thaer, III, 219

**agrariculture produce industries, dairy**, evolution between 16th cent. and 18th centuries, I, 395-97

**agrariculture produce industries, dairy**, milk analysis, Boussingault, IV, 68, 76, rate of obtained products, id., IV, 76, different mammals milk composition, A. Cattaneo, IV, 349; new components discovered, multiplicity improper compounds, Besana, V, 303

**agriculture produce industries dairy**, rennet, compounds & treatments plurality, De Serres, I, 393, spicies addition, id., 393; Lavazzeri, III, 72

**agrariculture produce industries, dairy**, water-buffalo *mozzarella*, producing method, Bruni, IV, 352

**agrariculture produce industries, dairy**, byproducts, lactose, separation process, A. Cattaneo, IV, 352

**agrariculture produce industries, dairy**, 20th century, research goals, Thibault, VII, 88-89

**agriculture produce industries, oenology**, grapes picking, evidence of grape ripeness, Crescenzi, I, 205-06; Herrera, I, 226; Alamanni, I, 239; De Serres, I, 454; Chaptal, III, 113; Bruni, IV, 346; imaginary advantages to pick unripe grapes, Gallo, I, 454, the long staying of grapes on the ground, id., 455; Tanara, I, 475; necessity to adjust harvesters number to vat capacity, Chaptal, III, 115, suitability successive gatherings as grapes ripeness proceeds, id., 115, with the grapes, the wait for the "*casse noble*" [noble mould], id., 115

**agriculture produce industries, oenology**, vine cultivation & wine producing in Moorish Spain, Al 'Awwâm, I, 183-84

**agriculture produce industries, oenology**, grapes treading procedure, Crescenzi, I, 206; Alamanni, I, 240; De Serres, I, 451; "red wine pressing" & "white wine procedure", Herrera, I, 226-27; choice between rasps elimination before treading & integral bunches pressing, Chaptal, III, 115, necessity the operation to be complete, so allowing fermentation to start for the whole mass, id., 116

**agriculture produce industries, oenology**, procedure to obtain the cooked must, Columella, I, 96-97; Herrera, I, 228; spices to be added, Columella, I, 97

**agriculture produce industries, oenology**, fermentation govern, Crescenzi, I, 206; Alamanni, I, 240; De Serres, I, 451-52, time of fermentation with dregs in accordance with the choosed colour, id., 452, imperative for the shortest possible ebullition, id., 453; Tanara, I, 475-476; distinction between the energetic and the imperceptible fermentation, Chaptal, III, 117-119, criteria for fixing the times of the former, id., 124, nine rules depending on conditions & purposes, id., 124, the expedients to direct the latter, id., 125; Bruni, IV, 346

**agriculture produce industries, oenology**, wines mixed with water, Gallo, I, 454, 456; De Serres, I, 456

**agriculture produce industries, oenology**, curing wine with spices, Columella, I, 96-97; De Serres, I, 456; special & spiced wines, Bruni, IV, 346

**agriculture produce industries, oenology**, 16th cent. Tuscany, grasps trituration during fermentation, Davanzati, I, 458

**agriculture produce industries, oenology**, *Théâtre* manifesto of the modern cellar technology, I, 446-47; Chaptal, III, 113; id., 325

**agriculture produce industries, oenology**, wine "diseases", Herrera, I, 227-229, correction acidity by special sand, id., 228, care of weak wines with strong wines dregs, id., 229; exclusion mineral compounds from correction means, De Serres, I, 456;

**agriculture produce industries, oenology**, 17th cent. Italy, testimony of quality wines, Redi, II, 325-27; 18th cent. backwardness cellar practices, Zanon, II, 327; the chimera of an ancient perfection, Manetti, II, 330, supposed expedients to improve quality, id., 331; contradictory cellarmen opinions, Battarra, II, 335; views about Tuscan wines quality, Accademia Georgofili, II, 329-330; backwardness of Italian oenology, Ridolfi, IV, 311; its imaginary splendour, Niccoli, VI, 244-246

**agriculture produce industries, oenology**, barrel cure before grape picking, Alamanni, I, 239; barrels' sulphuration, Gallo, I, 455; De Serres, I, 455; Bruni, IV, 346-47; barrels washing by see-water, Herrera, I, 22

**agriculture produce industries, oenology**, to rise alcoholic degree of poor must with raisin, Herrera, I, 228; Davanzati, I, 458; with concentrated must, Mitterpacher, III, 55; with sugar addition, Chaptal, III, 119, with honey or boiled must, id. 120, economic advantage utilising sucrose, id., 120

**agriculture produce industries, oenology**, clarification by proteinous matters, Herrera, I, 228-229; utilizable foodstuffs, Chaptal, III, 127



**agriculture produce industries, oenology**, Bordeaux region, stalks removing practice applied depending upon year course, Chaptal, III, 115

**agriculture produce industries, oenology**, difficulty of fermentation wine must with high sugar degree, Chaptal, III, 124

**agriculture produce industries, oenology**, fresh wines' filling up & pouring off, Chaptal, III, 125, pouring off performing by bellow, id., 126

**agriculture produce industries, oenology**, sulphuration, supposed reasons of efficacy, Chaptal, III, 125

**agriculture produce industries, oenology**, Friuli, proposal for the imitation of French wines, Bertoli, II, 327; refusal of imitation, claim of the advantages to manipulate local grapes with French methods to obtain typical Friuli wines, Zanon, II, 327-28

**agriculture produce industries, oenology**, in the barrels of Jura cellars *Mycoderma vini* & *Mycoderma aceti* colonies, the former beneficial, the latter prejudicial, Pasteur, V, 40-41, necessity microscopic examination to get rid of *M. aceti*, id., 40

**agriculture produce industries, oenology**, microbiology of wine must, culture substratum for dozens of microorganism species, waiting for proper conditions to prevail, Pasteur, V, 44-45, microbic must ecology, id. 45

**agriculture produce industries, oenology**, necessity, for trade regularity, of objective quality parameters and their stability, independent from cellarmen sensitiveness and the transport's time, Pasteur, V, 37-38, 51-52

**agriculture produce industries, oenology**, adulterations, substances used, laboratory processes to discover frauds, Bruni, IV, 346

**agriculture produce industries, oenology**, oxygen rate in wine analysis, procedure to draw a sample in round flasks where vacuum had been created, Pasteur, V, 47-48

**agriculture produce industries, oenology**, sparkling Champagne technology, Chaptal, III, 125; Ridolfi, IV, 311; Carpené, V, 293

**agriculture produce industries, oenology**, specificity of every vine mucus supposed reason of wines taste difference, Rozier, III, 91

**agriculture produce industries, oenology**, virgin wine from must percolated without treading, Chaptal, III, 116

**agriculture produce industries, oenology**, wine "diseases", cause of French wine markets loss, "greasiness" and acescence, remedies, Chaptal, III, 127; Pasteur, V, 37, necessity to pursue remedies research started by Chaptal, id., 37, commitment research by Napoleon III to Pasteur, id., 38, prevention by heating in bottle, tasting of treated wine by a commission of wine *négociants*, id., 51-52, certainty of scientific solution at the benefit of market expansion, id., 52

**agriculture produce industries, oenology**, wine "diseases", development of *Mycoderma aceti*, Pasteur, V, 39-40, *maladie des vins tournés* [stiring up] (of dregs), id, 41, *maladie de la graisse*, [greasiness] growth of filamentous bacteria colonies as effect of atmosphere's pression changes, identification agents, efficacy tannins treatment proposed by François, id., 43, *maladie du vin amer* [bitterness], an abnormal oxidization, id., 46

**agriculture produce industries, oenology**, wine vessels, cost advantages of terracotta containers, Herrera, I, 227; disadvantages wood barrels, Chaptal, III, 27, benefits glass vessels, id., 127; the wood ideal matter for gaseous exchanges, irrationality of glass & terracotta usage, Pasteur, V, 48-49

**agriculture produce industries, oenology**, wine-ageing, distinction between chemical phenomena & parasite intervention, id., 38-39, aging produced by slow oxidization of original compounds, id., 39, experiments to check if heat & light may stop the proliferation of microorganisms into wine bottles, id., 50

**agriculture produce industries, oenology**, wine blending, means to utilize cheap rough wines, which had no market, Bruni, IV, 347; professional ability great French *négoce*, id. 348

**agriculture produce industries, oenology**, end 19th cent., imaginary filling of wine quality gap between Italy & France, Niccoli, VI, 245-46

**agriculture produce industries, spirit manufacture**, characteristics of wines suitable to conversion, Rozier, III, 107; review of wines & beer produced in Europe which can be used, analysis, Arnaudon, V, 295

**agriculture produce industries, spirit manufacture**, list of fruits & roots containing sugars, V, 296, distillation process, sugarbeet juice, Arnaudon, V, 296-97, factory routine tests, id., 298

**agriculture produce industries, raisins**, making procedure, expedient to preserve, Herrera, I, 226; Alamanni, I, 241

**agriculture produce industries, wine succedaneous beverages, pulque**, Boussingault, IV, 53, cidre, production process, Estienne, I, 253; production advantages & consumption benefits, Evelyn, II, 59-60; modern production procedures & first chemical analysis, Laffon, V, 293

**agriculture produce industries, beer**, choice of cereals, Tusser, I, 263; Heresbach, id., 358; the fermentation process, Tanara, id., 474-75; Mortimer, II, 63; 1870, the artisan character of the process, Laffon, V, 293, peculiarities typical beer production in large consumption countries id, 293

**agriculture produce industries, beer**, end 19th cent., the volume of beer under 4° on the market, Arnaudon, V, 295

**agriculture produce industries, beer**, hop cultivation & utilisation, Tusser I, 264-65; Heresbach id., 358

**agriculture produce industries, wine vinegar**, home practice, industrial process, structures, frauds, Besana, V, 317-18

**agriculture produce industries, vinegar**, production by wood pyrolysis, id, 319; first significant conversion from manipulation of organic matters, V, 319

**agriculture produce industries, distillation**, Estienne, I, 254-55, utilisation in alchemic pharmacology, id., 255-56; wines for distillery, requisites, Rozier, III, 107; wine's spirit, technology for large factories, Chaptal, III, 127; industrial plants, building design, Arnaudon, V, 298

**agriculture produce industries, olive oil production**, dolia cleaning & waxing, Columella, I, 108

**agriculture produce industries, olive oil production**, mill, device structure, Cato, S. de la Bonnetrie, I, 37; Columella, I, 106, mill found in Stabia, Onorati, III, 142; treading devices, tools of tradition, Besana, V, 312; Manzi, Niccoli, VI, 239

**agriculture produce industries, olive oil pressing procedure**, Cato, I, 37; quality dependence from picking times, Columella, I, 106, treading, id., 107, spices addition, id. 108; production procedure, Gallo, id., 314; improvements in the technique, Grimaldi, Onorati, III, 142; Besana, V 312

**agriculture produce industries, olive drupae**, conservation in brine solution, Gallo, I, 313-14, compoting with spices, id., I, 314

**agriculture produce industries, oil production**, seeds & fruits from which it may be extracted, Estienne, I, 253-54; cultural methods, oil-cake utilisation for livestock, Ridolfi, IV, 307-08; Besana, V, 312-313; olive-husk & seeds oils, plants for extraction by solvents, Besana, V, 313, extraction oil utilized in soap manufacture, id., 313

**agriculture produce industries, the margarine**, "vegetal butter", Mège Mouriès patent, Laffon, V, 301

**agriculture produce industries, sugar**, list commodities usable to obtain distillable solutions, Arnaudon, V, 295, list vegetable species from which to produce crystallizable sugar, Monselise, V, 313, liquid sugars industrial utilization, id., 314

**agriculture produce industries, sugar from cane**, confutation diffusion in graeco-latin world, Piso, III, 325; first extraction mention in Avicenna, Vaccaro, III, 325; cane culture in Andalusia, Al 'Awwâm, I, 180-81; acclimatation essays in Provence, De Serres, I, 423

**agriculture produce industries, sugar from cane**, squeezing, ebullition, drying., Al 'Awwâm, I, 181; Vaccaro, III, 329 ; purification with soap, id., 330; purification process,

Davy, III, 283

**agriculture produce industries, sugar from cane import & purification**, Venice, I, 181; Genoese import, utilisation in orange candied production, Gallesio, III, 276

**agriculture produce industries, sugar from cane**, Sicily, diffusion between 9th & 11th centuries, spike in 14th cent., Vaccaro, III, 325-26, competition with American produce in 15th – 16th centuries, id. 326, improper culture & extraction condemned industry, Vaccaro, III, 326-27, soil, irrigation, cycle length true demand, 328, need for new squeezing & purification methods, 329-30; wishes of reintroduction to shatter tyranny of wheat economy, id., 324; comparison between beet & cane production costs, Ridolfi, IV, 295

**agriculture produce industries, sugar from cane**, fundamental rum role in plantation economy, Smith, II, 321, Vaccaro, III, 331

**agriculture produce industries, sugar from beet**, 19th cent. beginning Italy, tests of extraction from different botanic species, Mazzucato, III, 322; first tests from beet, yield modesty, Ridolfi, IV, 295; sugar grade slightness in 1871 cultivation experiments, Arnau-don, V, 297, incomparableness of test results in different regions, id., 297; disadvantages in comparison with European competitors for sucrose yield/ha inferiority because of summer temperatures, V, 298

**agriculture produce industries, sugar from beet**, Italy, Munerati's project to intro-duce resistance genes against *Cercospora* from wild *Beta maritima*, VII, 18; reliance in fu-ture Italian cultivars, D. delle Rose, VII, 81

**agriculture produce industries, sugar from beet**, juice purification with lime and, afterward, bone char, Monselise, V, 313, purification & cristallization plants in contin-uous, id., 314

**agriculture produce industries, silk**, reeling & weaving, history, De Serres, I 409; information of Middle Ages origins, ignorance of following centuries, Niccoli, VI, 230

**agriculture produce industries, silk**, reeling & weaving, 16th-17th cent., forecast expansion in Italy, Gallo, I, 335; international competition, progresses speed in France, De Serres, I, 409-10; cocoons reeling procedure, id., 410-11; wishes of introduction in England, Weston, II, 19

**agriculture produce industries, silk**, reeling & weaving machines, De Serres, I, 412; Giorgetti, II, 132; Amoretti, III, 78

**agriculture produce industries, silk**, reeling & weaving, 18th-19th cent., Italian pri-macy in yarn export, Giorgetti, II, 129, 132; Lavazzeri & Amoretti, III, 74; industry data in Milan, Bartolozzi, III, 74; exclusion from farm economy, becoming a urban manufacture, Amoretti, id, 78

**agriculture produce industries, silk**, reeling & weaving, competition between Italy & France, Ridolfi, IV, 314, V, 55; economic role in entire southern départements, Pasteur, V, 56

**agriculture produce industries, tannery**, skin manipulation after butchering, De Serres, I, 427, utilization goat ones as wineskin, id., 427

**agriculture produce industries, bone char**, production from butchering waste, utili-sation in food industry, Monselise, V, 317

**agriculture produce industries, resins**, supply sources & employment, Monselise, V, 315

**agronomy**, combination empiric practice with experimental science, II, 2-3; III, 19-20; id., 347-48, definition as the science «*aiming at identifying the means for obtaining vegetal productions in the most perfect and economic ways*», De Gasparin, IV, 157; system of procedures allowing for maximum production of organic substance per surface unit & its best distribution amongst different plant's organs, Coïc, VII, 100

**agronomy**, methods, application for a patent, Tarello, I, 339; Biancani, id., 348

**agronomy**, improvement of cultivation adopting procedures of gardening, Weston, II, 13-14; the conversion of the idea in Tull's "new agriculture", id., 103-04; application to wheat, Young, III, 19

**agronomy, experimentation**, high costs make necessary a public support, Young, III, 32; id., 183-84; IV, 22

**agronomy, experimentation**, questions about influence of soil characteristics on the experiment results, Lawes, Gilbert, IV, 105-06, at Rothamsted observed constant differences, whatever may have been meteorologic condition, amongst the various fertilising formulae systematically employed, which evidently prevails on different conditions, id., 106

**agronomy, research programs**, France, multiplicity of climatic regions and crops, need to centralise the guidelines of research, Braconnier, VII, 63-64; physiognomy INRA, leading agronomical institution and linchpin of national system, Bustarret, id. 76-77

**agronomy, research programs**, Spain 1950, projects of research to analyse characteristics of soils & evaluate needs irrigation & cultivation limits on dry land, pedologic maps of soils anomalies, in particular alkalis content, Alarcón, VII. 90; multiplication experimental stations with particular specialisation, Andrés, VII, 98-99

**agronomy**, from the unity to the multiplicity of the discipline's branches, III, 188; the role of *Grundsätze*, id., 246, which propose the nucleus of future agrarian disciplines, III, 214

**agronomy**, necessity of study for application., Columella, I, 59; Re, III, 300

**agronomy**, 16th century, incitement to multiply experiences, De Serres, I, 434

**agronomy**, 16th cent., empirical know-how precedes science achievements, II, 1-3; reciprocal autonomy in the correlation, IV, 7

**agronomy**, 16th cent., economic & demographic impulses driving the improvement of cultivation procedures, I, 278-80; II, 2; Weston, id, 11-12

**agronomy**, 16th cent., Latin authors consulted, I, 216, 233, 342, 362, 370, pre-eminence Columella authority, id., 233, 278, 378; II, 2

**agronomy**, 17th cent., analysis efficiency traditional practices for changing those which prove irrational, Weston, II, 12; foundation in criticism of practical experience, Thaer, III, 186-87

**agronomy**, 18th cent. end, the hampering role of Rozier biological doctrine, III, 92-93

**agronomy**, 18th cent., Italy, lack of any original agronomical text, II, 120, id., 160, id., 211-12

**agronomy, denshiring**, to burn prairies turf for reducing organic matter excess, Gallo, I, 287; Tarello, id., 341, 344; Mortimer, II, 63

**agronomy, foundations**, Virgil, I, 51; Columella, id., 78; Al 'Awwâm, id., 162; Gallo, id., 290; continual succession without fallow, De Serres, id., 380-81; comparison of different countries crop successions, Weston, II, 11; different needs attributed to root system deepness, Tull, II, 89-90, fallow necessity rejection, id., 122-23; Tull's confutation, Duhamel, id, 91; Mitterpacher, III, 48; Rozier, III, 101-02; successions classification on the base of intensivity, Thaer, III, 226-30, acknowledgment of benefits recognised by Classical agronomists, id., 231-32, different various spp. needs, id., 231, observation of continuous succession in market gardens, id., 232; history & efficiency, De Gasparin, IV, 179, the flimsy analysis of rotation mechanism, id., 183; supposition of different sources of N & C intake, Ridolfi, id. 277-78, reciprocal different spp. intolerance, id., 280; general characteristics, Cantoni, V, 220-21

**agronomy, fallow**, tillage of bare field in interval between subsequent crops, agronomical functions, I, 68; Columella, I, 71-73; 16th cent., De Serres, I, 380-81; 18 cent., Mortimer, II, 66;; replaceability by frequent hoeing, Tull, II, 86-87; its necessity, against Tull's theory, Duhamel, II, 189; 19th cent., advantages, comparison with continuous cultivation, Young, III, 25; fallow absolute necessity, Hall, possibility of getting over, Fiske, id., 26-27; favouring weed development the practice produces more damages than benefits, Mitterpacher, III, 49; 19th cent. Maremma, Cuppari, I, 75

**agronomy, fallow**, persistence until 20th century in Mediterranean regions, I, 383; differences between agrarian landscape observed by Young & Thaer & that by De Gasparin in respective regions, IV, 183

**agronomy, fallow's** overcoming & rotation introduction, Tarello, I, 343, conversion relationship between cereals & fodder crops, id 343-46; Berengo, I, 340

**agronomy**, China, ancient Chinese agronomic tradition is founded on *Qi Min Yao Shu* which Jia Sixie composed between 531 & 550 a. d. & on *Nong Zheng Quan Shu* by Xu Guangqi, who lived between 1562 & 1633 ad, VII, 433; Western agronomy was introduced in 1906 with the foundation of Peking experimental station, the success of fertilizers bought by first Japan factories suggested in 1934 the foundation of the first fertilizer manufacture in Nanking, in 1936 prof. Zhang Naifeng starts plot experiments on nitrogen doses. Only in 1983 Liebig's *Die organische Chemie* is translated, VII, 435

**agronomy, fertilization**, conversion manure into ashes, Pliny, I, 138

**agronomy, fertilization**, animal manures, classes & properties, Columella, I, 78-79; Pliny, id., 137-39; Al 'Awwâm, id., 170-71, properties explication on the base of Galen doctrine, id., 171; Mitterpacher, III, 48-49, Thaer, id., 196-97

**agronomy, fertilization**, matters and utilisation practices, Columella, I, 78-79; Al 'Awwâm, id, 170-72; Gallo, id, 286, practices, Heresbach, I, 7; supposed efficacious replaceability with ploughing multiplication, Tarello, I, 347; Tull, II, 87; experimental comparison effects different chemical compounds mixed with the same soil, Home, II, 114; chemical agriculture, Thaer, III, 196; comprehensive excellence of Po Valley tradition, I 287; Re, De Gasparin, IV, 167, 206; supposed ability of fertile soil to fix atmospheric N, Ridolfi, IV, 278

**agronomy, fertilization**, manure spreading, care for fast ploughing down, Columella, I, 79; De Gasparin, IV, 206

**agronomy, fertilization**, advice to dress matter containing sulphur, oil, nitre, Muratori, II, 102

**agronomy, fertilization**, compost preparation, procedure, Pliny, I, 139; compost recipes for any different crop, Al 'Awwâm, I, 171, compost drying, id., 172; utilization heat turfs for obtaining a compost, Heresbach, I, 354; Rieffel, De Gasparin, IV, 238

**agronomy, fertilization**, effectiveness reintegration soluble elements, De Saussure, III, 175; De Gasparin, IV, 206-07

**agronomy, fertilization**, advantages of blended fertilizers of "aerial" and mineral origin, Boussingault, IV, 62; advantages to rise vegetables which leave residues of "atmospheric" origin, id., 63, 66; Ridolfi, IV, 277; fabulous powers of "complex" fertilization, Ottavi, V, 159-60

**agronomy, fertilization**, theoretical hypotheses about biological foundation, Sprengel, IV, 13-14

**agronomy, fertilization**, Chilean guano, utilisation, De Gasparin, IV, 238; imports, information, Facen, V, 163, guano trade, nitreries layout & their exploitation, Monselise, V, 314

**agronomy, fertilization**, informations about origin of manures & manufacture wastes, Boussingault, IV, 52, manure composition desumed by every animal species metabolism, id., 59; manure composition variety, De Gasparin, IV, 209, dependence by forages quality, id., IV, 209; Macagno, V, 217; influence on final composition of mass maturing conditions & ammonia losses, an average dressing of 250 q/ha contains 160 kg N, 22 kg P<sub>2</sub>O<sub>5</sub>, 110 kg K<sub>2</sub>O & all microelements, Russell, VII, 207-8, uncertainty if manure be more efficacious than chemical fertilizers, but surely the former improves physical condit. necessary for absorption of latter, id., 207

**agronomy, fertilization**, forecast of industrial production of balanced fertilizers specific for every crop, Liebig, IV, 30

**agronomy, fertilization**, phosphate production starts from Lawes sulphuric acid reaction patent, IV, 88-89; sulphuric acid attack provides high concentration superphosphate, fusion with silicates produces glass which is milled, thermophosph., in the soil granule moistens and P reacts with Fe & Al, ammonium phosphates do not produce acid solution & combines slowly with Al, Russell, VII, 201, in Rothamsted plots manured for 115 yr. P percolated under 37,5 cm, proof that manure causes solubilization by favouring microorg. activity, id., 201, liming solubilizes phosphates Al & Fe, some plants, like lucerne, lupin & turnips utilize insoluble P, id., 201, against old concept of P made

inexchangeable, in fields dressed for long periods the crops reaction to new additions is low, proof of P disposability, *id.*, 202, at Rothamsted element dressing on a plot always fertilised with superphosphate was interrupted in 1901, in 1953 it still contained 400 kg P/ha more than plots recently dressed, *id.*, 202

**agronomy, fertilization**, advantages to buy fertilizers abandoning animal husbandry, Crud, Boussingault, IV, 61; De Gasparin, IV, 236, 239, utility fertilizers offered by market depending on prices, *id.*, 237; Ridolfi, IV, 281

**agronomy, fertilization**, benefits, analysis of combined effects of 2 fertilizers together proves a positive interaction when combination exceeds the results of 2 separate dressings, Russell, VII, 141

**agronomy, fertilization**, green-manuring, procedure, Columella, I, 78; Thaer, III, 196-97; Nebbien, IV, 339-340; ploughing in of young plants enriches soil in N, of mature ones in humus, Russell, VII, 165, in paddy fields green manure decomposition enhances reducing conditions, so to compell to check the process to prevent denitrification leaving growing rice without N, *id.*, 215

**agronomy, N fertilization**, Rothamsted, 1893, addition effects are limited to the same year only, Gilbert, VI, 110, alternate dressing of N & mineral salts show complete satisfaction of crops needs the yr. of N addition, lack in the yr. of mineral compound distribut., *id.*, 110, analysis of drainage water proves percolation of not absorbed N, *id.*, 110; nitrates have the fastest effects, ammoniacals cause Ca washing away, the cheapest is anidrous ammonia, whose dressing requires complex machines, pastures absorb N compounds speedily, arables more slowly, causing washing away, quantities should be adjusted to the foreseeable mineralization, Russell, VII, 205

**agronomy, K fertilization**, Rothamsted, 1893, dressing effect persistence, after conspicuous addition crops show to satisfy needs for decades, Gilbert, VI, 111; ideal concentration in soil solution for absorption  $5 \times 10^{-5}$  M, exigent species may require more, Russell, VII, 203-04, at Rothamsted plot where addition was interrupted in 1901, in 1957 gave sugar-beet more than plots never dressed, in which 125 kg/ha were added for the year crop, *id.*, 204

**agronomy, fertilization**, pre-eminence of N role, Lawes, Gilbert, opposition by Liebig, IV, 98-99, 109; De Gasparin, IV, 208; Ridolfi, IV, 275

agronomy, fertilization, Provence, marsh litter ploughed down in vinyards, De Gasparin, IV, 237

**agronomy, fertilization**, reintegration soil ability to transfer new ions to solution can be replaced in microirrigation adding a solution of elements required by every phenological crop-phase, Broidi, VII, 291; peculiarities of salts used in these solutions, Gardinger, VII, 292

**agronomy, fertilization**, sulphur, needs of lacking S soils met by superphosphate, dressing elemental S it is converted in sulphate by oxidizing bacteria, Russell, VII, 206-07

agronomy, fertilization, first plants to treat P & K minerals, Monselise, V, 314; market enlargement after 1950, VII, 366

**agronomy, fertilization**, 1950 Spain, mandate to experimental stations to identify crops wants to rationally devise industrial fertilizer dressing in all country's regions, Andrés, VII, 99; France, meaningfulness fertilizer tests on poor soils in irregular climate condit. a in Aquitaine, Malterre, *id.*, 101; Italy, inquiry for rational fertilizer utilization increase, Ferrari, *id.*, 102; Rumania, government engagement for enlarging fertilizer use, Davidescu, *id.*, 103; S. U. production phosphate enriched with Mn, Wlassjuk, *id.*, 103; Yugoslavia, leucite employ in potassic fertilizers industry, Nikolic, *id.*, 104

**agronomy, ploughing**, shaping the field in balks (*lirae*), Varro, I, 42; Columella, *id.*, 71-74; Pliny, *id.*, 142; Alamanni, *id.*, 234; Gallo (*colle*), *id.*, 289;; Clemente (*gombine*), *id.*, 361; De Serres, *id.*, 380-81; Tanara (*vanegge*), 467-68; Tull (*ridges*), II, 87; Thaer, III, 202; Maremma, Imberciadori, *id.*, 75; in first 19th cent. Italy use is universal, Re (*prose*), III, 318; inability balks to regulate humidity in the root explored soil, Ridolfi, IV, 303;

**agronomy, ploughing**, necessity to adapt the work to soil moisture, Columella, I,

70-71, choosing working time depending on meteorologic conditions, id., 71; Alamanni, id., 234; need to consider soil peculiarities, Mortimer, II, 66; operation is dangerous under point of inferior plasticity, which in every soil depends on texture & organic substance, when improper ploughing produces compact clogs, in wet earth tractor wheels will slip creating a smooth surface preventing air to penetrate into the soil, Russell, VII, 229

**agronomy, ploughing**, breaking up of virgin grassland, De Serres, I, 380

**agronomy, ploughing**, research for the optimal depth, Young, III, 17-18; Drezgic, VII, 79-80

**agronomy, ploughing**, purposes: turning out soil, expose it to the atmospheric agents, addition of fertilisers, weeds elimination, Thaer, III, 198-99; France, research of the effects of soil ploughing, Ringelmann, Demolon, then Caquot, 1958, new criteria fixed by Inra, Bourdelle, VII, 96

**agronomy, ploughing**, criteria for an efficient execution, Thaer, III, 198-99; the level of humidity in the ground must be below that at which the soil loses its plasticity, which is lower than field capacity, ploughing a too moist soil can not produce a seedbed suitable for the purpose, difficulties to plough largest fields with the best results diffused the use of chisel & subsoilers, which break the earth without turning it over, in the arid & windy regions the most rational practice is stubble mulch cultivation, operated by cultivators fitted with wide sweeps which do not remove the residues of the previous culture, Russell, VII, 229, operation interrupts capillarity & avoids evaporation, lowers the daily max. temp. promoting roots activity, delays the earth heating in the spring, its only inconvenience, id. 229

**agronomy, ploughing**, beginning 19th cent. Italy, perfection of work must imitate the spade's operation, Lambruschini, III, 349; derision of the Tuscan aphorism of "*the spade having the golden point*", Ridolfi, IV, 119, 290; reproposal by Ottavi to reach the chimerical virgin earth, V, 161; works for wheat in lowest Veneto 6, Marche of Urbino 3, Re, id, 318; imposition to métayers of an excessive number, Ridolfi, IV, 288, principle of decreasing productivity, those after the third are totally useless, id., 288, diversity habits in regions of different demographic density, id., 288

**agronomy, rotation**, the sabbatic idle year, Leviticus, I, 12 foundations, Virgil, I, 51; Columella, id., 78; Al 'Awwâm, id., 162; Gallo, id., 290; continual succession without fallow, De Serres, id., 380-81; comparison of different countries crop successions, Weston, II, 11; different needs attributed to root system deepness, Tull, II, 89-90, fallow necessity rejection, id., 122-23; Tull's confutation, Duhamel, id, 91; Mitterpacher, III, 48; Rozier, III, 101-02; successions classification on the base of intensivity, Thaer, III, 226-30, acknowledgment of benefits recognised by Classical agronomists, id., 231-32, different various spp. needs, id., 231, observation of continuous succession in market gardens, id., 232; history & efficiency, De Gasparin, IV, 179, the flimsy analysis of rotation mechanism, id., 183; supposition of different sources of N & C intake, Ridolfi, id. 277-78, reciprocal different spp. intolerance, id., 280; general characteristics, Cantoni, V, 220-21

**agronomy, rotation**, France, millenary regional survival of biennial & triennial rotations, Bloch, I, 380

**agronomy, rotation**, Lombardy, 16th cent., schemata multiplicity, Gallo, I, 290; 18th cent., Amoretti, III, 65-67

**agronomy, rotation**, relationship between fallow, cereals & *Leguminosae*, Tarello, I, 343-45; Duhamel, II, 189

**agronomy, rotation**, biennial, account of investment & income of a typical Orange holding, De Gasparin, IV, 235-36, advantages to substitute rotation on the base of the rate of N soil saturation, id., 236-38, 241

**agronomy, rotation**, triennial, reasons for diffusion & secular persistence, Thaer, III, 226-27, agronomical, economic, social benefits, id., 227, comparison with modern successions, id., 236-38

**agronomy, rotation**, arithmetical summation of fertility inputs & outputs, Thaer, III, 192-193; fertility balance sheet of biennial rotation, De Gasparin, IV, 234-35; Ridolfi, IV,

**agronomy, rotation**, triennial, evolution, the “composed” trienn. rot., Thaer, III, 229, the four-year rot., id. 229, the “alternate rotations with pastureland”, id., 229, prevalence of grazing or grains cultivation, id., 229, comparison of Holstein & Mecklenburg systems, alternate rotation with pasture, id., 229, alternate rotation with stable feeding, id., 229, the last final point of rotation evolution, id., 300

**agronomy, rotation**, Norfolk cycle canonical scheme for central Europe, Von Fellemberg, IV, 2; fertility balance sheet, Von Schwerz version, id., 2; Boussingault, IV, 64

**agronomy, rotation**, English experience, the progressive assembling of rotation factors, Thaer, III, 233; wheat yield increase combined with meat production on the same fields, Gilbert, VI, 131-32

**agronomy, rotation**, forages insertion necessary for need of manure, even if an economic burden, De Gasparin, IV, 240

**agronomy, rotation**, French definitions, *succession & assolement*, the former considering years succession, the latter crop distribution in the same year, IV, 178-79

**agronomy, rotation**, necessity to alternate spp. intolerant to their own root's exudate, De Candolle, Ridolfi, IV, 280; the Gilbert's erroneous confutation, VI, 113 **agronomy, rotation**, successions evaluation by organic matter balance, Boussingault, IV, 63-65; *Leguminosae* N role in balance sheets, id., 64

**agronomy, rotation**, where fertilisers are cheap on the market advantages of rejecting any rotation schema, Boussingault, IV, 61; De Gasparin, id., 237, vision of future agriculture based on nitrogen offered by market, id, 240; Ridolfi, id., 281

**agronomy, rotation**, arithmetical summation fertility inputs & outputs, Thaer, III, 192-193; fertility balance sheet of biennial rotation, De Gasparin, IV, 234-35; Ridolfi, IV, 279-80

**agronomy, rotation**, French definitions, *succession & assolement*, the former considering times, the latter fields covering in the same year, IV, 178-79

**agronomy, rotation**, necessity to alternate spp. intolerant to their own root's exudate, De Candolle, Ridolfi, IV, 280; an erroneous confutation, Gilbert, VI, 113

**agronomy, rotation**, Norfolk cycle canonical scheme for central Europe, Von Fellemberg, IV, 2; fertility balance sheet, Von Schwerz version, id., 2; Boussingault, IV, 64

**agronomy, rotation**, Rothamsted, plot-research of general laws of different crop combinations, mechanism resolution in its factors, Lawes, Gilbert, IV, 92, single crops fertility addition or withdrawal, id., 93, 1843, the experimental plan starting, id., 93, option for its unlimited continuation with the same crops & procedures, id., 94, 1852, subsequent adjustments, id., 94, collateral experiments to the main project, id., 94, evidence, from first results, of capital nitrogen role, id., 94; Liebig confutation of fertility hypothesis, id., 96

**agronomy, rotation**, first Rothamsted plan results, 1851, first Liebig objections on the *Briefe*, the Gilbert & Lawes' reply, IV, 96, yield from fertiliser patented by Liebig equals that of a no-fertilised plot, id., 98, proof that N is essential condition for profitable yields, id., 99; 1855, Liebig's pamphlet against the plan's results, Lawes & Gilbert new reply, refusal of Royal Agriculture Society to publish Liebig's insulting counter-reply, id. 100; claim that N benefits would consist in phosphates solubilization, Liebig, id.106, fanciful hypothesis of N accumulation until field indifference to new dressings, id.107; reply that N effects are immediate & cease in one only season, Lawes, Gilbert, id., 107; ascertainment that increasing N input one obtains decreasing yield increments, id., 107

**agronomy, rotation**, mineral theory of Liebig multiplies contradictions in successive editions., Lawes, Gilbert, IV, 102, groundless denial of nitrogen role for plants development, id., 103, univocality interpretation by international literature of Liebig's ideas, who boastfully claims to be misunderstood, id., 101

**agronomy, rotation**, Rothamsted 1893, after turnips without any dressing, barley gives satisfactory yields for good tillage without turrips luxuriance, Gilbert, VI, 115, in dressed plots max prod. in combination with fallow & grazed rapes, id., 15, N intake de-



depends on turnips utilization: higher after grazing, reduced after pulling out to the stable, id., 115, yields in any case lower than in monosuccess, with max. fertiliz. turnips luxuriance exhausts N & P, id., 121, 125

**agronomy, rotation**, Rothamsted 1893, unsuccessful clover in many cycles replaced by beans, tiny yield but in any case N enrichment of soil, Gilbert, VI, 116, better production in plots receiving perphosphate, id., 116, on next crop opposite effects with or without fertilisation: in the former case clover improves soil conditions, in the latter accentuate the nutrient lack, id, 117

**agronomy, rotation**, Rothamsted 1893, N intake, rotation & monosuccession comparison proves that wheat's is higher in rotation for any different factor combination, whilst barley after turnips suffers from turnips fertilised and brought to stable, which reduce intake under that of no-fertilised cultivation, but benefits from rape grazing on the field, Gilbert, VI, 122-23

**agronomy, rotation**, Rothamsted 1893, wheat, last cycle's crop, sums up effects of other spp., Gilbert, VI, 117, highest yield after turnip grazing & clover, id., 117, 125, without fertilisation fallow predisposes the field better than clover, which absorbs the disposable nutrients, id., 117, dressing only perphosphate the choice between fallow & clover is meaningless, id., 117, after the years favourable to clover wheat yields touch the top, id., 118, grain & dry matter produce higher than in monosuccession, id., 121; higher dry matter production completely due to straw, id., 121; influence on Rothamsted yields by 19th century wheat height, id., 122 entity P removed with sold products imposes reintegration, Gilbert, id. 125,

**agronomy, rotation**, Rothamsted 1893, after turnips without any dressing barley gives satisfactory yields for good tillage without turips luxuriance, Gilbert, VI, 115, in dressed plots. max prod. in combination with fallow & grazed rapes, id., 15, N intake depends on turnips utilization: higher after grazing, reduced after pulling out for the stable, id., 115, yields in any case lower than in monosuccess., with max. fertiliz. turnips luxuriance exhausts N & P, id., 121, 125

**agronomy, rotation**, Rothamsted 1893, clover unsuccessful in many cycles was replaced by beans, tiny yield but in any case N enrichment of soil, Gilbert, VI, 116, better production in plots receiving perphosphate, id., 116, on next crop opposite effects with or without fertilisation: in the former case clover improves soil conditions, in the latter accentuate the nutrient lack, id, 117

**agronomy, rotation**, Rothamsted 1893, N intake, monosuccession & rotation comparison proves that wheat's is higher in rotation for any different factors combination, whilst barley after turnips suffers from turnips fertilised and brought to stable, which reduce intake under that of no-fertilised cultivation, but benefits from rape grazing on the field, Gilbert, VI, 122-23

**agronomy, rotation**, Rothamsted 1893, wheat, last cycle's crop, sums up effects other spp., Gilbert, VI, 117, highest yield after turnip grazing & clover, id., 117, 125, without fertilisation fallow predisposes the field better than clover, which absorbs the disposable nutrients, id., 117, dressing only perphosphate the choice between fallow & clover is meaningless, id., 117, after the years favourable to clover wheat yields touch the top, id., 118, grain & dry matter produce higher than in monosuccess., id., 121; higher dry matter production due to straw, id., 121; influence on Rothamsted yields by 19th cent. wheat height, id., 122 entity P removed with sold products imposes reintegration, Gilbert, id. 125,

**agronomy, rotation**, Chicago 1893, the core of Agrarian Revolution, in the frame of Columbian celebrations, IV, 91, the ideal conclusion of the cycle opened by Weston, id., 91; experimental plan illustration, Gilbert, id. 91; the new relationship between arable & animal farming, , id., 92-112

**agronomy, rotation**, the summary of Agrarian Revolution, 1893 Chicago, in the frame of Columbian celebrations, IV, 91, the ideal conclusion of the cycle opened by Weston, id., 91; experimtal plan illustration, Gilbert, id. 91; the rotation from Thaer's theory

to Lawes & Gilbert's conclusions, III, 234-35, adding new reasons explaining rotations' efficacy, VI, 129-30; integration of organic & mineral cycles in the soil as achievement of Agrarian Revolution, id, 129-30; enucleating 2 centuries of experimentation, Rothamsted proposes the prospects of any successive development, IV, 130

**agronomy, rotation**, Tuscany '800, irrationality of triennial succession maize, wheat, wheat: lacking of any forage compells to buy feed & manure, Ridolfi, IV, 282, apparent advantage to insert forages as "catch crops", Ridolfi, IV, 292-93, trials with four-years: tap-root, wheat, clover, wheat, id., 282, maize substitution to tap-root & luzerne extra-rotation, id., 283, farmers reception, id., 284; comparison of Tuscan cycle & rotation with forages, Cuppari, id., 373-74

**agronomy, rotation**, planimetric problems when changing the year number of a succession, practical examples, Cuppari, IV, 374

**agronomy**, Re, experimental sciences' rejection, III, 395-96

**agronomy**, coinage of word *zootechnie*, for animal husbandry's science, De Gasparin, IV, 156

**agronomy**, 19th century, the humistic belief of German scientific culture, IV, 12

**agronomy**, promiscuous cultivation (arable fields separated by vine-tutor trees), peculiarity of Italian agriculture, hindrance to rational cultivation, Ridolfi, IV, 286, impediment to give vines cares required for wine quality, id, 310; Italian farmers' boast, "*l'ombra d'oro*", the [golden tree shade] on wheat, Jacini, IV, 287; condition for olive groves rentability, Caruso, V, 229-30, proof of Mezzogiorno's agriculture backwardness, id., 231

**agronomy**, 19th cent. Italy, delay in updating scientific culture, V, 119, agronomic plurality of heterogeneous schools in preunitarian principalities, unification unables to start more solid connections, id., 120, disorientation showed by 1877 parliamentary inquiry about agriculture classes whose contradictory conclusions are presented to the King in 1882, id., 121

**agronomy**, need for new methods suitable for Central Italy arid hills, Ridolfi, IV, 265, his engagement in successive works, id, 266, 331

**agronomy**, 19th century, improving cultivation [*coltura miglioratrice*] would allow for progressive returns of investments Ridolfi, IV, 330, a solution for Thaeer's financial problem of easy bankruptcy for too a hurried introduction of "new agriculture" standards, id., 328

**agronomy**, endeavour of a new knowledge organization on the basis of a matrix combining farm's factors, Cuppari, IV, 385

**agronomy**, theory of imaginary "*complessità*" [complexity] conceived to confute the results of Ville's experiments about fertiliser effects, Ottavi, V, 160

**agronomy**, proposal of substituting the word with *agrologie*, De Gasparin, IV, 156; acceptance by Ridolfi, id. 268, but following general disagreement, id, 331

**agronomy**, refusal of a general science of agriculture, profession of empiricism, Re, III, 297-98; refusal of any theoretical framework, Von Schwerz, IV, 4

**agronomy**, the journey as a means to ascertain the reality of agrarian geography, Weston, II, 9-10, usefulness of comparing practices of different countries, id., 12-13; Muratori, II, 100; Young, III, 2; Re, III, 298-99; Von Schwerz, IV, 5; Burger, IV, 8

**agronomy**, the scientific disciplines which dispose themselves as its foundation, II, 2-3; Ridolfi, IV, 273-74

**agronomy**, classical, theory, predicated upon the relations between plants and water, reveals its limits for an agriculture with insufficient water resources., Israel, VII, 286-87, key classical agronomy soil enrichment, with first benefit in the improvement of field capacity, which has no sense for the new technique, aiming to maximize water transpiration of single plant, id., 288-90

**agronomy**, Paraná, trials to verify utility of traditional *queima*, stubble burning, Baldanzi, VII, 97-98

**agronomy**, 20th century, "alternative" agricultures, suggestions & illusions spread new agricultural "philosophies" in Europe & US, where in 1989 National Research Coun-

cil decided to study these formulas looking for truly innovative practices and ignoring any psychologic motivations, the inquiry verified how many solutions adopted by critics of traditional agricult. were truly rational and cost effective, the Council trayed to for-see in which misure these practices could contribute to the agriculture of the future, the average of the farms studied revealed to be innovative, from the philosophy the farmer claims, they frequently reduced the need of industrial inputs, which, with yelds something higher than the average ensured a good profitability, VII, 407-08

**agronomy**, eteronomous schools and doctrines for a "new agriculture", in contraposition to agriculture science founded on chemistry and biology, first mouvements start last 60' of 20th. century on the wave of reaction to deleterious effrects of insecticides and aticryptogamic compounds, VII, 383-85, proselytes gathered from milieus extraneous to agriculture, generally without any knowledge about, claiming the will to practise a "biological" (continental Europe) or "organic" (English speaking countries) agriculture; they profess a keen dislike for any chemical compound (fertilisers, parasite-killers) and new powerful machines, in the following years including seed produced by the new genetics, expecially by gene transposition, id. 384-85, in search of philosophical guidelines, to justify refusal of scientifical agronomy, the leaders claim the absolute perfection of the practices sealed by tradition, or engage themselves in obscure lucubrations they pretend to be real "scientific" demonstrations, id. 385, amongst the *gurus* the Japanese Fukuoka, who possessed an authentic experimental competence, proposed, in 1975, a doctrine suggesting a radical reduction of human interference in natural processes claiming that, free to establish their equilibria, plants and animals would produce everithing necessary to human needs, his results appeared prodigious, but the disciples were everywhere incapable to repeat the successes of the master, id. 385-87; the Italian Garofalo, even with an agronomic experience, gathers a school under the standard of Draghetti, late director of Modena exprimental Station, author of a *Physiology of the farm*, printed in 1948; a clever experimenter, but unacquainted with history of agronomy, Draghetti treads in Thaer footsteps even ignoring the German's texts, in the simplest terms repeting a farm being a living organism, whose physiology consists in the perfect integration of the cycle of organic matter with that of mineral compounds, so developing a system of exchanges of nutrients between field crops and livestock, an idea whose application at the time of the publication already was a pure chimera, id., 387-88; in France Lemaire starts in the 60' a campaign against any new agricult. technoloy, his best follower, Saint Hénis, organises the teacher's claims in the manifesto of the opposition against the conversion, at time in tumultuous progression, of the traditional France agriculture into a modern economic sector, trying to demonstrate the horrifying dangers of the new productive means and boasting his lucubration as a true interpretation of Pasteur's pensée, which probably he never had read, id. 389-90; Aubert publishes in 1977 *L'agriculture biologique* picking up every imaginable proofs of the damages imposed by chemistry to human life and claiming the worst are inexplicable, a fact whose cause would be the impossibility to follow the translocation of the molecules produced by chemical synthesis, ubiquitous and uncontrollable ghosts, capable of lethal effects at any unanalyzable dose, the unique way to prevent dangers being the interruption of any production, damages of same gravity would be produced by animals obtained by the modern selective breeding, id., 392-94; even an occultist, from the cultural milieu which precedes the nazi "science", the Croatian Rudolf Steiner, proposes himself as a master of a new agriculture philosophy, mixing in a colorful hocus-pocus confused reminiscences of alchemy, astrology and banal sorciery, he conceives the formulae to convert animal putrefied organs, full of rotten flowers or bark, in true "condensers" of stars powers, to be inoculated in the soil giving it the potential of astronomical yelds id, 395-96; amongst his disciples a passionate amateur of pedology, Pfeiffer, composes a blend of occultism and soil science which finally follows in the steps of Thaer, so emphasising the effectivness of the "new" 18th century agronomy, id. 398; ostentatiously claiming he will secure the neophits of organic agriculture the bases of a new science capable to defeat that of Galileo and Bacon, Altieri holsts the flag of

*Agroecology*, of which he would be the prophet, presuming to prove the insubstantiality of all the agronomical knowledge of the past centuries, ignoring the texts of hundreds of agronomists whose he never heard the names, claims the new science would verify any geographical, social, economic implication of any cultivation procedure, incapable to suppose that this was exactly what great agronomist were engaged to do for three millennia, always connecting agriculture's practice to the economic and social conditions of their time, id, 399; ensure his contribution to the exciting illusion an epistemologist, Norgaard, & an agriculture's historian, madam Hecht, the former reducing to a mechanical game the origins of experimental science, whose appears to ignore the fathers, the latter racounting the history of European agriculture as the history of the monosuccession, professing a false idea shared by number of American farmers, who never practised any kind of rotation, but Madam is presented to readers as an historian of world's agriculture, whose she proves to know only the consociations between herbaceous and arboreal species typical of primitive tropical agricultures, which she conceives as the only rational and productive way to obtain the fruits of the earth, id, 401-2; teorethical engagement of pioneers of "new" agricultures collapses at the end of the century' when adepts concentrate their passion on the preeminent problem to obtain more and more conspicuous public subsidies, disregarding any doctrinal concern, as for the leaders, they continued their campaign against "chemical agriculture", the surest way to improve the business, and the continuous research of expedients allowing the yelds of associated farms to approach those obtained by traditional practices, id., 405; but obtaining, without chemistry's means, production comparable to those of "chemical agriculture" proposes objective difficulties: if the difference would be too large, all the devotees would be induced to the fraudulent use of chemicals, with the risk that the lucrative castle would be mined and collapsed, the only way to exorcise the danger being to give the adepts simple and effective means allowing for productions which, adding the public subsidies, could make the farm budgets sure and wealthy, id. 406

**agronomy**, water scarcity, possibility to increase soil reserves shaping it in bulks, or applying fallow, choosing precocius varietis of crops, forestalling the sowing, using expedients to prevent plants to expand superficial roots, Russell, VII, 227-28

**agronomy**, new millennium, necessity to increase global agrarian production, a need imposing an enormous engagement in research, supported by the will of nation community, the science disposes of means to win the challange, but political support is insufficient, as in 2000 claimed T. Reeves, general CIMMYT Director, VII 460-478; agrarian development is impossible in the world's poor regions without the progress of public health, culture, transport system, that is civilisation, N. Borlaug, id., 479; Asti report 2011 certifies after 2000 a increase in agrarian research financing by international community, rising its agromic bill from 26,1 31,7 billion \$, China gained the first pace in global spendig, reaching the 13% of total investments, wilst India riduced its bill & agricultural progress slackened, id. 479-480

**arable crops**, proposal of a classification, De Gasparin, IV, 176-77, connected analysis of cultural procedures, id., 175

**arable crops, cereals**, preservability foundation of historical role, I, 10-11, 14; taming centres, first hypotheses, China, southwest Egypt, intertropical America, De Candolle, VI, 7; the role in civilisation history, Reed, VII, 269; first cultivation geography, Helbaeck, Renfrew, VII, 243; prairy burning for hunting would have diffused cereals in Egypt, Harris, id., 262; proofs of cereals utilization in Paleolith. Egypt 15.000 b. p by sickle flints & a flat & a round grinding stones, Reed, id., 266, cereals would have passed Suez isthmus 13.000 b. p. & would have diffuse in Palestine, where Natufian hunter-gatherers would have adopted sickle & grinding stones, id. 266, cereal plenty would have induced Natufians to make them their staple, completly changing life-standards, to preserve grain building huts on a silo, so creating a village, id., 266, cereal-based agricult. would not be born in spontaneous grain fields, but in areas where gathereres would be driven by demographic pressure, where spontaneous grains did not grow, and to produce them it

was necessary to sow them, first known agrarian village Çayönü, where cereals would have been cult. 9.400 b.p., Reed, id., 267, all the civilisations stand on cereals, taming them by fixing analogous genes which hinder natural reproduction, as gatherer favours genes for spontaneous dissemination, cultivator by reaping selects for genes which reduce natural diffusion, civilisations are based on plants "preadapted" for cultivation, id., 267; spontaneous grains yield entity tests in Turkey, Central America, Africa for exactly weighing, Harlan, id., 325

**arable crops, cereals**, classification, Pliny, I, 130-132; Jasny, id., 131; Heresbach, id., 356-57; Lombardy, cultivated wheats, Gallo, id., 291; France, De Serres, id., 384-86

**arable crops, cereals, *Triticum aestivum***, phylogenesis, first mutatione obtained by man the rachis resistance after ripening, Hildebrand, Darwin, V, 114, mention of the first wheat strains collection to try new crossings., id., 115; the employ of Jordan criteria for classifying primitive Asia e Europe mate cereals, Vavilov, VII, 39-40; Helbaeck suggested the exaploid wheat progenitor in charred caryopses found in Neolithic settlements in Iran, Irak, Anatolia, supposing it could be derived from crossing between *T. dicoccum* & *Aegilops squarrosa*, whose original area do not overlap with that of *Dicoccum*, proof that crossing would have followed first cultivation and genome duplication, so that the capital event would have occurred between a tetraploid and a diploid wheat, Zohary, VII, 235

**arable crops, cereals**, wheat, ratio yield/seed entity, Egypt, Genesis, I, 10; famine probabilities for relation change, id., 10; the ratio in old agriculture, Columella, Carcopino, I, 76;; Sicilia, Cicero, id., 76; Lombardy, Gallo, I, 292; pretension exactness antiquity data, Dickson, III, 392; 1850 Maremma, Cuppari, id., 76

**arable crops, cereals, *Triticum aestivum***, seed anatomy, Poncelet, III, 96, hypothesis of primitive traits recovery if sowed in a wild prairie, id., 96

**arable crops, cereals, *Triticum* species**: at Roman empire times the space occupied in a hold would have promoted naked grains against hulled, Jasny, I 131

**arable crops, cereals**, culture, seed-crop quantity, Columella, I, 72; Gallo, id., 292; Tull, II, 87; sowing succession, Egypt, Genesis, I, 10; Columella, id, 72-73 Tusser, id., 262-63

**arable crops, cereals**, wheat, expedients to reduce seed-crop entity, Gallo, I, 292-93

**arable crops, cereals**, wheat, intensive cultivation, use of horse-hoe, Tull, II, 86-87; application gardening procedure, Young, III, 19-20, tests for maximum yield, id., 19, which undoes rentability, id., 19;

**arable crops, cereals**, wheat, old ecotypes inability to large production for stalk height, Young, III, 19, straw value in ancient economies, as fodder and thatching material, id. 20

**arable crops, cereals**, wheat, diversity role in biennial cycle & in rotation with fertility-improving spp., Ridolfi, IV, 302

**arable crops, cereals**, wheat, 19th century, six times as much the seed balance the costs, Ridolfi, IV, 304, doubling manure crop value multiply for six, id., 305, product. unity value doubles, but the analysis ignores the limits of field fertility and of wheat old races productivity, iwhich do not follow Ridolfi mathematics of decreasing costs, id., 305

**arable crops, cereals**, wheat, beginning 19th cent. Brianza, mention cultivation Gentilrosso, Capitani, III, 320; Reggio Emilia, mention of emmer (or spelt) culture, Re, III, 320; comparison of different strains yield, Cantoni, V, 221

**arable crops, cereals**, wheat, 1893 Rothamsted, comparison of plots in monosuccession, one without fertiliz., one manured every year, in the former yields fall, in the latter rise with fluctuations in bad years, Gilbert, VI, 108, progressive increases from no fertilized plot to those receiving phosphate & mineral salts till those dressed with increasing N doses, id., 108, adding more N one can equal and even surpass yield of manured plots, id., 109, adding N without mineral elements produce is major than dressing mineral elements without N, but in the long run the absence of minerals exhausts the soil, id. 109

**arable crops, cereals**, wheat, new breeding, 1866 Canada, Saunders new cultivars allow for northward expansion of fields sown with *Red Fife*, VII, 13, Saunders jr. develops first cross-products creating *Marquis*, precocious & productive, id,13; in S. Dakota Mc

Fadden crosses *Marquis* with emmer obtaining *Hope*, rust-resistant, id. 14; 1920, in Minnesota Hayes crosses wheats with wild parents obtaining cold resistant cultivars which substitute spring less productive wheats, id. 14; success of Allen's researches about rust strains, id. 14

**arable crops, cereals**, wheat, breeding, 20th century Russia, analysis process frost-thaw essential for the improvement of winter wheats, Vavilov, VII, 48, the physiological conditions of hardening, id., 48, Russian traditional varieties show the greatest resistance to frost among all the globe's, but they can not withstand worst winters, id., 49

**arable crops, cereals**, wheat, new varieties breeding, beginning 20th cent. Italy, Strampelli aims to escape *stretta* (grip), the July dryness which interrupts caryopses replenishment, crossing an Italian wheat, a German of high yields & a Japanese of dwarf stalk, obtaining varieties more & more near his goal, VII, 16, Draghtti & Gibertini, contributing to his wheats success experimenting early N dressings, id, 16; 1950 Italy, his successors projects modesty, De Cillis, VII, 64

**arable crops, cereals**, wheat, fertilizat., 1959, varieties created for high yield demand max. N availability for plant & caryopses, large first dressings imposes high final additions, Coïc, VII, 100

**arable crops, cereals**, wheat, new varieties breeding need to meet new planet population hunger, Vavilov, VII, 62, technological characteristics of future wheats, id., 61, to improve the resistance to Russian winter, id 46, new breeding foundation knowledge traits all entries of world's wheats inheritance, id., 38, necessity cooperation all disciplines & competent scientists, id, 62; 1999, Cymmit mission to verify need to replace all of the varieties used in Central Asia, Kazakhstan & near countries to get rid of obsolescence of soviet constitutions, identification of traits which should possess varieties for a region of great aridity, whose economy do not allow to dispose of the best inputs, VII, 357

**arable crops, cereals**, maize, variety types, assent to hypothesis origin from teosinte (*Euchlaena mexicana*), Darwin, V, 117; genetic demonstration of descent, Mangelsdorf, Reeves, Beadle, Emerson, VII, 255-56

**arable crops, cereals**, maize, 1847 constitution by R. Reid of first Corn Belt "dent" variety, V, 148

**arable crops, cereals**, maize, genetic variability, adaptability to different environment, strains instability, Ridolfi, IV, 300; 19th cent., differences between Lombardy & Tuscany, IV, 300; practices identity even in the latter without irrigation &., inferior yields, Ridolfi, IV, 301

**arable crops, cereals**, maize, Germany, negative results Italian early varieties, Thaer, III, 216; confidence in their diffusion, Burger, IV, 9; drying in granaries through stoves, Thaer, III, 216

**arable crops, cereals**, maize, 1950 breeding, engagement of French research, Bustarret, VII, 77

**arable crops, cereals**, maize, 1977 demonstration of *Euchlaena mexicana* (teosinte), titles of maize parent by crossing with maize & verification reappearing maize spikes at second generation as established by Mendel laws, unsubstantiability proves parental links with *Tripsachum*, Beadle, VII, 331-32

**arable crops, cereals**, rice, economic importance, Al 'Awwâm, I, 162; cultural cycle, id., 162

**arable crops, cereals**, rice, hypothesis of introduction into Europe, Spolverini, II 141

**arable crops, cereals**, rice, 16th cent. Italy, economic benefits, hopes of diffusion in Lombardy, hindrances: spreading marsh diseases, Gallo, I, 294-95 cultivation & water management, id., 294; place in the rotation, Spolverini, II, 138, cultiv. practices, id., 142-45; Amoretti, III, 65, lowering water level if luxuriance becomes excessive, id., 65 husking, machines & operation ways, Spolverini, II, 148; Zanelli, V, 220

**arable crops, cereals**, rice, ploughing in large estates, Spolverini, II, 141-42, direct seeding, id., 142, transplantation tradition in the East, id., 145, scuffling, id., 144-45; Amoretti, III, 65; threshing by mares team, Spolverini, II, 146, sieving & drying, id., 147

**arable crops, cereals**, rice, expected advantages from introduction in Tuscany mo-rasses, Ridolfi, IV, 309

**arable crops, cereals**, rice, 1950 Spain, crossing program of national with foreign varieties, mostly Italian, Oyanguren, VII, 81

**arable crops, cereals**, rice, nutritional value, chemical analysis samples from different countries, Zanelli, V, 220

**arable crops, cereals**, barley, Rothamsted 1893, difference yields plots without fertilizer & max. fertilizer, Gilbert, VI, 95, dressing only N yield higher than with other combinations, id., 97, manure allows production stability, different mixtures production fluctuations & falls, id., 98

**arable crops, cereals, Triticale**, first identification of wheat-rye hybrids, casually then artificially obtained, colchicine employed to redouble chromosome endowment, last 20th cent. decades cultivar creation of increasing yields, with the potential of new utilization, so of subtracting land to other cereals, the CIMMYT leading role, Hede, VII, 360-61

**arable crops, cereals**, reaping, the cutting of spikes only, Columella, I, 74-75; cutting of entire stalks, Alamanni, I, 237

**arable crops, cereals**, dredge, mixture of wheat, rye, emmer, diffusion in 16th cent. France, De Serres, I, 384

**arable crops, cereals**, spring sowing, dependence on meteorologic conditions, Tusser, I, 260

**arable crops, cereals**, reaping, indeferable task, Alamanni, I, 237; Tusser, I, 261-62; 16th cent. Provence, the migration of mountain peasant to reap on plains, De Serres, I, 386

**arable crops, cereals**, cultivation practices for rye, barley, oats, Thaer, III, 210-11; the same plus spelt & emmer, Ridolfi, IV, 307, qualities required when produce is to be brewed, id, 307; elementarity of agronomical rules, Cantoni, V, 221

**arable crops, cereals**, husking of hulled grains, Pliny, I, 143

**arable crops, cereals**, mutant induction by irradiation, number mutants obtainable, difficulties to precisely identify mutations obtained, Larose, VII, 79

**arable crops, Leguminosae**, species of the family, Pliny, I, 131, benefits on fertility, Columella, I, 78; Gallo, id. 290; Mortimer, II, 65; Thaer, III, 232; release N absorbed from atmosphere, Boussingault, IV, 47-48; hypothesis N absorption through leaves, Ville, V, 158; supposition N absorption through roots, Solari, V, 167

**arable crops, Leguminosae**, symbiosis with rhizobia, one plant may develop 1.000 nodules, equal to 4,5 g., *Leguminosae* transferred in new continents must be accompanied by their specific bacteria, at Cornell fixation ensures 390 kg N/ha, whose major part will stay in the soil, in N. Zeland till 530 kg, the best N hoarder are forage *Leguminosae* with continuous developm., producing new roots all the season long, it is not known if N is transferred to cereals during the season, in pastures transfer is operated by cattle through excrements, Russell, VII, 176; increase in N fertilizers price suggests research for utilizing symbiosis carried by leguminous bushes, common in Africa, whose soils are N poor VII, 465

**arable crops, Leguminosae**, 1893 Rothamsted, contrary to any other spp., N increases in the soil without any dressing, a condition favouring any succeeding crop, Gilbert, VI, 100-103, clover on an exhausted field allows subsequent barley to absorb N, proof it leaves N in the soil, id. 101, different spp. respond to N addition enhancing carbohydrates synthesis, beans' increase is trifling, id., 103., in every experimental conditions *Leguminosae* store up more N than that was disposable in the soil, id., 101, 131

**arable crops, potato**, experiences in open fields, Thaer, III, 215, advantages cultivation by share-cropping with peasants, exploiting all the family's labour, id., 215-16, winter conservation in heaps covered by compressed earth, id., 216

**arable crops, potato**, supposed reasons abundance of edible produce, Quartapelle, III, 134; imaginary power to extract land's last resources, Liebig, IV, 37

**arable crops, potato**, price correlation with wheat's, Smith, II, 305-07; absence in

Tuscany of market price, Ridolfi, IV, 294

**arable crops, potato**, winter cultivation proposal, Giovene, III, 135, in Italy traditional use seed-tubers from previous crop causes yield smallness, Bonvicini, VII, 80

**arable crops, sugar-beet**, Rothamsted 1893, reactivity to N dressings, Gilbert, VI, 93, sucrose produce depends on N, increasing doses ratio decreases weight total mass & sucrose increase, benefit from chlorides addition, id., 94, research of the best balance between sucrose ratio & total root weight, id., 94; low beet sugar productivity in Italy, Ridolfi, 295

**arable crops, tobacco**, 1950 Spain, program to create new cultivars with better combustibility & resistance to viruses, Mira, VII, 81, lay-out of map of regional suitability to different varieties, id., 81

**arboriculture**, biological reasons for the diffusion in dry regions, Ridolfi, IV, 310  
arboriculture, origins, multiplication of pear, apple, fig, vine varieties in Bronze Age, Odyssey, I, 20

**arboriculture**, general rules, Palladius, I, 146-47; Al 'Awwâm, I, 161; Gallo, I, 303-305; Davanzati, I, 366-67; De Serres, I, 419-20; La Quintinye, II, 36-37; Mortimer, id., 64-65; Trinci, id., 217; Rozier, III, 102-03, Onorati, id., 141-42; De Gasparin, IV, 176; Ridolfi, id, 319-20; Roda, id, 343-44, V, 203-05

**arboriculture, pomology**, cultivated varieties produced by selection, not by cultivation, Gallesio, III, 266-67, inability of grafting to create new varieties, id., 267

**arboriculture, pomology**, cultivated varieties product of selection, not of cultivation, Gallesio, III, 266-67, inability of grafting to create new varieties, id., 267

**arboriculture, pomology**, Spain 1950, ricostituted collections of varieties lost in Civil War, Catalina, VII, 82

**arboriculture, fruit trees**, its stress in Arabic agronomy, I, 161, Al 'Awwâm, I, 177-78, different species consociation, researches about affinities & disaffinities, id., 177

**arboriculture, fruit trees**, nursery management, Al 'Awwâm, I, 178, expedients at transplant time, id., 178

**arboriculture, fruit trees**, reproduction of species with thin seeds, Al 'Awwâm I, 179, reproduction by marcot, id., 179-80; reproduction by seed, Estienne, id., 250-51; scion radication, stimulation by hormones, Lecrenier, VII, 65

**arboriculture, fruit trees**, criteria for choosing the terrain for an orchard, Gallo, I, 303, choice of distances depending on soil fertility, Al 'Awwâm, I, 177; Gallo, id., 303-04, expedients at planting time, id., 304

**arboriculture, fruit trees**, branches classification, La Quintinye, II, 42, distinction between branches producing fruits or new wood, id., 42, structural branches, their progressive order, id., 42, peculiarities of fruit-bearing branches of *Drupaceae*, id., 43

**arboriculture, fruit trees**, grafts: clef (*a fessuolo*), awl (*a coronetta*), pipe (*a cannello*), budding (*a scudetto*), Gallo, I, 305; awl (*a marza*), pipe (*a buccia*), budding (*a bucciolo, a scudicciuolo*), Davanzati, id., 366-67: times for grafting young trees in the nursery, De Serres, id., 420, improving fruit quality by successive grafts, id., 420

**arboriculture, fruit trees**, utilisation of wild stocks, Gallo, I, 304- 305, utilisations of stocks born from a cultivated variety seed, id., 305, in both cases obtaining large trees; the first author who achieved how to reduce foliage volume by dwarfing stocks was La Quintinye, II, 46; suggesting the Paradise for apple-trees, id., 46; 20th cent. selection of dwarfing stock at East Malling Exp. Station, Hampshire, Lecrenier, VII, 65

**arboriculture, fruit trees**, pruning, productive & aesthetic reasons, Gallo, I, 307; La Quintinye, II, 39, the most suitable times, id., 40, proportioning future fruit produce to tree's vigour, id., 42; tree's productive life length imposes to renew its structure, La Quintinye, II, 44; manpower wants for pruning linchpin of orchard economy, Lecrenier, VII, 65-66

**arboriculture, fruit trees**, "green" pruning, purposes & expedients, La Quintinye, II, 47, summer "nipping", rupture of new sprouts to correct the tree shape, id., 47, the use of rods to give the new branches the correct direction, id., 48



**arboriculture, fruit trees**, tillage of orchard soil, La Quintinye, II, 45

**arboriculture, fruit trees**, winter root activity, La Quintinye, II, 41, correlation between foliage thriving & roots expansion, id., , 36,, reasons for reducing root expansion, id., 46, negative correlation between vegetative luxuriance & fruit production, id., 46; transition between growing & productive phases, the hormones role, Lecrenier, VII, 85

**arboriculture, fruit trees**, bidimensional frames, the espalier, advantages, De Serres, I, 420; La Quintinye, II, 43-44; peach & plum trees shaped as fan "*a ventaglio*", Ridolfi, IV, 320; peach tree as squared fan (*a ventaglio quadrato*) & branched candlestick (*a candelabro*), Roda, IV, 344, tridimensional forms, shaping, peculiarities, La Quintinye, II, 43, apple & pear trees in pyramid form, Ridolfi, IV, 320

**arboriculture, international market**, ending 19th cent. European press magnifies the new giant, California whose contribution will make U S citrus & dry fruit export reach 10,5 million \$., VII, 20, Panama Canal project kindles competitors fears, Minister Nitti envoys Molon to U S., id., 20-21, the mission purposes, id., 21-22

**arboriculture, international market**, California, cultivated spp., groves surface and land recently planted, produce value, Molon, VII, 26, success foundations are product selection & commercial rigour, id, 26-27, preserve industry functional complement of fresh produce market, marks & production volumes, id, 28, Dept. of Agric. engagement for amplifying produce range with new species, id., 28-29, the role of major breeders., portrait of L.Burbank, id., 29-30

**arboriculture, ampelography**, catalogue vine cultivars, Columella, I, 83; Herrera, id., 223; Rozier, III, 104-05

**arboriculture, ampelography**, distinctive traits vine varieties, Columella, I, 90; Herrera, id., 223; Rozier, III, 104-05

**arboriculture, ampelography Nomentanae**, physiognomy, Columella, I, 83, *Amineae*, selection to increase productivity, id., 87-88

**arboriculture, ampelography** inconsistency identification Roman vine varieties, Dalmaso, Marescalchi, I, 83

**arboriculture, ampelography Murleau**, physiognomy, Rozier, III, 104-05, *Pineau*, id, III, 104

**arboriculture, ampelography Torrontes**, physiognomy, Herrera, I, 223

**arboriculture, ampelography** 1950 Spain, restoration varieties collections destroyed by Civil War, genetic analysis to increase national range, inquiry of microelement local lack, Trueba, VII, 83

**arboriculture, viticulture**, plant nobility, Soderini, I, 372

**arboriculture, viticulture**, choice of soil, knowing the traits of good and bad ones, Columella, I, 82, 89 and vine varieties considering wine quality, id., 83, , Al 'Awwâm, I, 184; De Serres, I, 448; advantages of planting different varieties in separate sectors, Columella, I, 90; Crescenzi, I, 204-05, plantation costs, Columella, I, 85-86, invested capital profitability, Lo Cascio, I, 86; Graecinus, I, 89

**arboriculture, viticulture**, vinyard soil preparation by deep digging, Columella I, 89, propagation, nursery plantation, id, 86, varieties improvement by individual plants observation, id., 87, shoot choice, *malleoli* [little hammersid., 88; the same of De Serres' *maillots*, I, 448; soil tillage in a young vineyard, Columella, I, 91; basin making around trunk by hoe, Al 'Awwâm, I, 184; Herrera, I, 224; soil work at maturity, frequency, Alamanni, I, 238; autumn earthing up, Gallo, I, 449, soil work frequency, id., 449; De Serres, id., 450

**arboriculture, viticulture**, vineyard's layout, vine trained upon trees, distance between trees, Columella, I, 94, choice of suitable trees, id, 94; Gallo, I, 448; De Serres, I, 448; shaping as individual yoke, Columella, I, 91- 93, shaping on a reed circle, id., 93, shaping as branches creeping on the ground, id. 93; shaping on a single pole, De Serres, I, 448, general diffusion in France, id., 448; shaping as a bush, Columella, I, 93; Soderini, I, 373; De Serres, I, 448

**arboriculture, viticulture**, pruning at first year end, Columella, I, 91; pruning in

three shaping years, Herrera, id., 225; annual pruning, criteria, Columella, id., 92, choice of branches to leave from soil fertility, id., 92; procedure, Al 'Awwâm, id., 184; choice between early or late performance, benefits & risks, Herrera, id., 224; Alamanni, id., 235

**arboriculture, viticulture**, grafting, methods by cleft and by drill, Columella, I, 93, scion choice, id., 93; Herrera, id., 225

**arboriculture, viticulture**, fertilisers dressing depending on soil characteristics, Al 'Awwâm, I, 184; Gallo, id., 450; De Serres, id., 450; vine irrigation, Gallo, id., 450

**arboriculture, viticulture**, corruption of an ancient vineyard soil, Columella, I, 88-89, restoration of degraded vineyard vitality, id., 93; thickening by layers, Al 'Awwâm, id., 184; Alamanni, id., 235; Soderini, id., 373; De Serres, id., 448

**arboriculture, viticulture**, Friuli's similarity to soil & climate conditions of Burgundy, II, 327-28, induces to competition, not to odd imitation, Zanon, II, 328

**arboriculture, viticulture**, infusion in vines of antidote properties, Herrera, I, 225; Soderini, id., 374

**arboriculture, viticulture**, transfer of vine varieties on seas, expedients, De Serres, I, 448

**arboriculture, viticulture**, wine industry geography, Soderini, I, 372-373; Bacci, id., 459-60; Chaptal, III, 113

**arboriculture, viticulture**, against phylloxera invasion European viticulture resorts to American stocks, Viala, VI, 142

**arboriculture, viticulture**, 1950 Italy, economic weight, triflingness scientific engagement, results of project to re-establish vineyards destroyed by phylloxera in Triveneto enlarging high quality varieties area, Dalmasso, VII, 84

**arboriculture, viticulture**, effectiveness & secular longevity of Columella teaching, I, 95 Herrera, I, 223-24; Gallo, De Serres, I, 446,447; Sernagiotto, VI, 244

**arboriculture, olive cultivation**, Italy, hypotheses about origins, Vettori, I, 370-71; history, geography, taxonomy of cultivated varieties, Columella, I, 99, Plinio, Macrobio, id., 99, Gallo, id., 313, Caruso, V, 226-228; Niccoli, VI, 239

**arboriculture, olive cultivation**, myths about plant & produce, Vettori, I, 370

**arboriculture, olive cultivation**, soil characteristics for the grove, Columella, I, 100, the choice of the nursery terrain, id., 100, nursery plantation, id., 100, young tree pruning in the nursery, id., 100, at transplant preservation of plant orientation in the nursery, id., 101; Landi, III 68 irrigation need for young plants, Columella, I, 101; Landi, III 68; planting distances, Columella, id., 101, tree production & soil exploitation alternation, id., 102, soil tillage frequency, id., 102; plantation expedients, Davanzati, I, 368; transplantation, Landi, III, 68, soil works, id., 68

**arboriculture, olive cultivation**, want of slaves & equipment for a grove, Cato, I, 36-37, how to sell the produce, id., 38

**arboriculture, olive cultivation**, fertilization, Columella, I, 102; Davanzati, id., 368; used matters, Lavazzeri, III, 69; role for increasing production, De Gasparin, Ridolfi, IV, 312-313; deduction soil needs from timber ashes analysis, Caruso, V,

**arboriculture, olive cultivation**, mature trees pruning, desultory performance, Columella, I, 102; execution criteria., Davanzati, I, 368; fertile branches renovation, Lavazzeri, III, 69; need to prevent production alternation, Ridolfi, IV, 312

**arboriculture, olive cultivation**, picking times, Cato, I, 38; Columella, I, 106, drupae turning black maturity proof, id., 106; damages from beating down fruits, Alamanni, id., 242; Gallo, I, 313; in Lombardy necessity to escape snow, Lavazzeri, III, 70; care to pick & press at once, Ridolfi, IV, 314

**arboriculture, olive cultivation**, wish of the diffusion in the Appennine foothills, Muratori, II, 103

**arboriculture, olive cultivation**, 16th cent. Garda coasts, characteristics, Gallo, I, 313

**arboriculture, olive cultivation**, 19th century Tuscany, backwardness, production esiguity for improper pruning, any fertilization's lack, Ridolfi, IV, 312, benefits of intensive culture with fertilization proved by De Gasparin, Ridolfi, IV, 313

**arboriculture, olive cultivation**, 1950 Italy, for renewing culture research on genome,

flowering biology, propagation technique, new plantation schemas, Jacoboni, VII, 85

**arboriculture, olive cultivation, *Dacus oleae*** damage prevention, precocious picking in whole a region, Lavazzeri, III, 70; average grove lifetime depending on latitude, Caruso, V, 228, prevention parasite damages, id., 231-233

**arboriculture, olive cultivation,** propagation, use of *ovoli* ("eggs") from wild trees, Columella, I, 100; propagation by cuttings, Gallo, id., 313; use *ovoli* domestic varieties, Vettori, id., 371; procedure details, Lavazzeri, III, 68

**arboriculture, olive cultivation,** regional forms of slope terracing, plant association & rotations, Caruso, V, 229-231

**arboriculture, mulberry cultivation,** climatic needs, supposed possibility of cultivation in G. Britain, Weston, II, 19; impossibility in Prussia & Russia, Amoretti, III, 75, failures in Central Europe countries, Ridolfi, IV, 315; grafting procedures, Betti, II, 132; nursery lay-out, Amoretti, III, 76

**arboriculture, mulberry cultivation,** species' varieties & leaves quality, Gallo, I, 337-38, dependence leaves quality from soil, id., 337; mulberry varieties & cultural cares, Betti, II, 132; Amoretti, III, 75-76, leaves harvesting & trees vitality, id., 76; cultivars range enlargement, Ridolfi, IV, 315

**arboriculture, mulberry cultivation,** drawbacks of tree lines in cereal fields, rationality of pure groves, Amoretti, III, 75; Ridolfi, IV, 286, tree-distance in groves determine production times & leaves quality, id., 314-317

**arboriculture, citrus cultivation,** pomology, insubstantiality Linnaeus' taxonomy, Gallesio, III, 266 distinction of species and hybrids, id., 273

**arboriculture, citrus cultivation,** citron-tree, clues of introduction in late Roman times, Gallesio, III, 273-74, history introduction in Europe of different species, Gallesio, III, 273-75, lemon, bitter orange, diffusion by Islam, id., 274-75, then in Liguria & Europe by crusades, id., 276-77

**arboriculture, citrus cultivation,** basic practices, Venuto, I, 231; Alamanni, id., 245; Gallo, id., 309-13; De Serres, id., 421-23; Lavazzeri, III, 68

**arboriculture, citrus cultivation, aranciere** architecture in patrician chateaux, De Serres, I, 421-23; La Quintiye, II, 38

**arboriculture, citrus cultivation,** 16th cent Garda Riviera, market cultivation in greenhouse, Gallo, I, 309-13, species & varieties typical of Garda, id., 309, ordinary & extraordinary years profits, id, 312

**arboriculture, citrus cultivation,** France, De Serres, id. 421

**arboriculture, citrus cultivation,** grafting, gardeners secret know-how, Gallo, I, 309, pruning, gardeners secrets, id., 311

**arboriculture, citrus cultivation,** propagation by seeds, De Serres, I, 421-22, per scion, id., 422

**arboriculture, citrus cultivation,** winter protection, Alamanni, I, 245; Garda 16th cent., times & expedients for placing the *giardini* roofs, Gallo, id., 310, the choice of the time to take them away in springtime, id., 311; northern countries, structures and practices, De Serres, id., 423

**arboriculture, citrus cultivation,** thinning out of flowers and buds, Gallo, I, 311-12, use of thinned flowers in candy manufactures and perfumery, id., 312

**arboriculture, citrus cultivation,** 18th cent., difference in stocks used in Liguria & Sicily, Gallesio, III, 278; marquis Airoidi brings in Palermo's Conca d'oro Ligurian know-how

**arboriculture, citrus cultivation,** beginning 19th cent. prospects future citrus geography on the globe, Gallesio, III, 278

**arboriculture,** 19th cent U S, fruit market, New York, maritime & railway calls, commercial storehouses, Molon, VII, 24, fruit auctions, id, 30

**arboriculture,** third millennium, the challenge on fruit international market will be decided by genetical innovation, the lack of support to research in Italy, Sansavini, VII, 490

**biochemistry**, pharmacology, Galenic four properties theory, Crescenzi, I, 196-97  
**biochemistry**, fat accumulation process in animals, Bosc, III, 248-49; Boussingault, IV, 67-8

**biochemistry**, fermentation, distinction from alchemists' putrefaction, Estienne, I, 255; supposed mechanism for every transformation of organic matter, Rozier, III, 90-91, confusion with putrefaction, id., 91, supposed identification of the starting element in mucilage, id., 91; the fancy idea of uniformity of the two re-proposed by Liebig, IV, 31-32, who attributes the phenomenon to the nitrogen "instability", id., 32

**biochemistry**, hypothesis ammonium cycle among atmosphere, soil, plants, animals, Liebig, IV, 25; De Gasparin, IV 159; analysis soil's nitrogen, Macagno, V, 295; Ridolfi, IV, 275; proof of insubstantiality imposes research of ionic forms of N assimilation by roots, VI, 77

**biochemistry**, bees ability to synthesize wax proves animal's ability to shape new molecules, Dumas, Milne Edwards, IV, 73

**biochemistry**, guidelines for experiments on animal nutrition, Young, III, 31; Boussingault, IV, 70-73; id, 74-76

**biochemistry**, every microorganism performs peculiar chemical reactions in living or dead organic substances, properties of alcoholic & lactic ferments Pasteur, V, 28, wine alterations, id, biology, immunization processes preceding Pasteur's discoveries, VI, 39-41

**biochemistry**, microorganisms' role in organic substances demolition, Pasteur, V, 35 the discovery of the elements of equilibrium between soil & atmosphere, VI, 76-77; Beijerinck, VI, 89, role of denitrification bacteria, id, 89, C & N exchanges regulation between atmosphere & living world, id, 89

**biochemistry**, human nutrition, the necessary ration for essential vital functions, Thaer, III, 259, distinction between subsistence ration & production ration, id., 259; Boussingault, IV, 71; research of C & N quantities indispensable for humans different ages, De Gasparin, IV, 216, subsistence & work rations for man, woman, children, id., 217-19

**biochemistry**, protoplasts, 1922, Kotte & Robbins operate meristems development in vitro, 1939, the procedure applied to different organs, White, VII, 8; use anther's protoplasts in genetical engineering, VII, 278

**biochemistry**, supposition vegetables to give back to air more chemical elements than they absorb from atmosphere, Rozier, & the same with soil, III, 94

**biochemistry**, transfer of mineral elements from vegetables to herbivorous, from herbivorous to carnivorous, Boussingault, IV, 67

**biochemistry**, usefulness microorgan, study to improve knowledge of higher vegetable physiology, Pasteur, V, 36, utilization & elimination mineral elements in animal metabolism, Boussingault, IV, 71-72; Ca essential for pigeons, Chassot, IV, 72; NaCl for quadrupeds, Boussingault, IV, 75

**biochemistry**, vegetable decay proves CO<sub>2</sub> formation from atoms of different origin combined by photosynthesis, De Saussure, III, 171, demonstration vegetable nutrition from air, necessary & sufficient character, id., 172-175, demonstration of absorption CO<sub>2</sub> from the atmosphere essential explanation of the life cycle, id., 178; Liebig, IV, 24-25

**biochemistry, alcoholic fermentation**, 1777, identificat. reagents & end products, Mitterpacher, III, 53-55; the must components, 1800, Chaptal, III, 121-122; wine analysis, malic & citric acids, id., 127; a new analysis, Boussingault, IV, 53; proof that process do not produce lactic acid, Pasteur, V, 23; identification new components, Carpené, V, 293

**biochemistry, alcoholic fermentation**, key process conversion sugar into alcohol & CO<sub>2</sub>, Chaptal, III, 118-19, Lavoisier equations, reagents - end products, id, 121, equation of simple elements, id., 122, stoichiometric relations among sugar, alcohol, CO<sub>2</sub>, id., 122; Lavoisier equations, experimental & analytical errors, id., 122; identification character of a oxidation reaction, id., 122; first correction quantities alcohol e CO<sub>2</sub>, Boussingault, IV, 52; integration of Lavoisier equation with H<sub>2</sub>O molecules necessary to cut sucrose

molecules, Dumas, Boullay, Pasteur, V, 14, integration with glycerine & succinic acid production, id. 15

**biochemistry, alcoholic fermentation**, must temperature condition to start, Chaptal, III, 117, effects: heath, CO<sub>2</sub> & alcohol production, wine colour derives from grape-skin, De Serres, I, 451, Chaptal, III, 119

**biochemistry, alcoholic fermentation**, necessity presence of yeast, unknown entity, Chaptal, III, 118; necessity albumin or gluten, Boussingault, IV, 52; if yeast increases its mass must be a living creature, Pasteur, V, 16, volume CO<sub>2</sub> produced shows an O<sub>2</sub> utilisation major than that by theoretical calculation, which must be attributed to cellulose & fatty acids formation by yeasts, id., 16-17

**biochemistry, alcoholic fermentation**, presumed necessity O<sub>2</sub> for the process to start, Chaptal, III, 117, performance experiments, which prove the contrary, id., 117; Gay Lussac demonstration that sterilised must do not ferment, inferring necessity O<sub>2</sub> to do so, V, 19; 1859 Pasteur's confutation based on 'optionally' anaerobic nature of yeasts, Partington, id. 19, demonstration that glycerine & succinic acid weight is major than that of yeasts, proving they are living creatures, Pasteur, V, 16-17

**biochemistry, alcoholic fermentation**, hypothesis origin from putrefaction, Liebig, IV, 31-32; assent to Liebig thesis, Boussingault, IV, 53; review suppositions ancient naturalists, Besana, V, 307

**biochemistry, alcoholic fermentation**, review discoveries Leeuwenhoek, Fabbroni, Thenard, Pasteur, V, 18-19, discovery by Cagniard de Latour & Schwann ability yeast to multiply its cells, id, 19; demonstration, against Thenard, that yeast absorbs N & multiply, id, 19, proliferation increases organic mass, confuting Liebig claims, id, 20 microscopic examination confirms proliferation, id, 20

**biochemistry, alcoholic fermentation**, review assents to Liebig catalytic theory, acknowledgment analogies with alteration of organic substances, demonstration of inconsistency similarity, furious replay of Liebig, Pasteur, V, 21; enzymes discovery, Hahn, Buchner, future attribution phenomenon to enzymes, V, 21

**biochemistry, alcoholic fermentation**, to obtain the most precise weight of end products use of minimal yeast quantity, Pasteur, V, 15

**biochemistry, alcoholic fermentation**, wine colour derives from grape-skin, De Serres, I, 451, Chaptal, III, 119

**biochemistry**, pharmacology, 19th cent., improvement slenderness because of persistent ignorance of disease causes, VI, 38-39

**biology**, casual generation statement, Theophrastus, I, 30, casual transmutability, id., 30-31; 16th century, the doctrine of *generatio ex putri* held by De Serres, I, 435-36; 1668-87, demonstration that every larva hatches from an egg, Redi, II, 26-27; that every mollusc hatches from an egg, Marsili, II, 32; that every vegetable bore from a seed, Malpighi, id, 32; arguments against the peripatetic axiom, Tull, id, 82-83; claim that rye-grass may derive from the degeneration of rye, Ronconi, id, 225; 1853, demolition hypothesis spontaneous generation of microscopic fungi, De Bary, IV, 250-51; 1860, the Paris Académie des sciences announcement of a competition about, 1861 Pasteur presents his *Mémoire*, V, 28, the polemic between Spallanzani & Needham, id., 28-29, research by Schwann reason of air sterilization obtained by Spallanzani, id., 29, Schröder & Von Dusch repeat his experiences, id, 30

**biology**, 18th century end, equivocal identification between water & peripatetic phlegm, Rozier, III, 89

**biology**, parasite fungi, subtraction of host's vital substances, T. Tozzetti, II, 244, 249

**biology**, Ingen Housz's discovery of O<sub>2</sub> emission from vegetables, Quartapelle, III, 133; identification combustion with respiration, id., 132-33; intuition complementarity animal respiration & vegetable photosynthesis, Davy, III, 287; Liebig, IV, 24-25; the animal as an engine powered by combustion, Boussingault, IV, 67, identification in the nitrogen of food's power, De Gasparin, IV, 160

**biology**, "pangeneses" theory, cells' ability to put forth "gemmae" with their own traits, Darwin, V, 128, getting together "gemmae" would combine the character of new beings, id, 128, supposition of identity of sexual & agamous reproduction, id., 121

**biology**, the equilibrium among animal body organs, man inability to foresee selection effects of one trait on all the others, Darwin, V, 153-54; organic equilibrium law, Geoffroy St. Hilaire, necessity resort to biometry for any future selection, Vavilov, VII, 61-62

**biology**, 1959, antiparasite compounds, collateral effects, new molecules proliferation imposes research of possible unforeseen effect so to avoid damages to natural systems, Grandi, Russo, VII, 72-74, objective dangers: useful insects elimination, damages to livestock & wildlife, accumulation of non-toxic doses may defer lethal effects, need for a controlled utilisation resorting everywhere possible to predators of parasite insects, id, 74; dangers for improper use of antiparasite compounds suggest to verify potential of biological defense, Bustarret, VII, 77; hopes kindled by Berlese' discoveries not confirmed for the multiplicity of crop enemies, diffusion parasite strains resistant to treatments imposes to intensify the researches promoted by the first international organization in the field., Grison, VII, 106, research predators against *Dacus oleae*, *Ceratitidis capitata*, *Lymantria dispar*, first experiments with *Bacillus thuringiensis*, id, 107

**botanic geography**, floras composition, relation between latitude & altitude, A. von Humboldt, Boussingault, IV, 80

**botanic geography**, Vavilov missions: 1916 Iran, Pamir, '24 Afghanistan, '25 Khorezem, '26 Mediterranean, '27 Ethiopia, '29 China, '30-'32 southern & central America, VII, 43, visiting 8 centres of cultivated spp. origin made it possible to trace specific presentation of 95 regional cards, id., 50

**botanic geography**, agricult. origin centres, Abyssinia, wheat, even if not originary, expresses an extraordinary types 'variety, Vavilov, VII, 53

**botanic geography**, agriculture origin centres, central Asia, wheat birthplace, Vavilov, VII, 52; semidesertic regions, Afghanistan, id. 56

**botanic geography**, agriculture origin centres, China, supposed first agriculture birthplace, cultivated spp. list, Vavilov, VII, 50

**botanic geography**, agricult. origin centres, India, comprising Hindustan, Assam, Burma, rice inclusion, Vavilov, VII, 50-51

**botanic geography**, agriculture origin centres, Indian-Malayan region, Vavilov id., 51; northwestern India, geographic description, climatology, botany, the savannah & the irriguous agriculture, id., 57

**botanic geography**, agriculture's origin centres, Mediterranean, olive birthplace, garden vegetables, Vavilov, VII, 52-53

**botanic geography**, agriculture origin centres, Near East, Asia Minor, wheat birthplace and number of fruit-trees: vine, fig, walnut, Vavilov, VII, 52

**botanic geography**, agriculture origin centres, Caucasus, geography, climatology, botanic description, environments variety, agriculture antiquity, Vavilov, VII, 55-56

**botanic geography**, agriculture origin centres, Egypt, geography, climatology, botany: cultivated species millenary selection product in exceptional conditions, Vavilov, VII, 57-58

**botanic geography**, agriculture origin centres Iran-Turkestan, the oases, geographic, climatological, botanic descript., peculiarities spp. adapted to desertic condition, Vavilov, VII, 56

**botanic geography**, agriculture origin centres Pamir-Badakhshan, geography, climatology, botanic description, peculiarities spp. cool desert, Vavilov, VII, 56-57

**botanic geography**, agricult. origin centres, South America: Brasil, Paraguay, part of potato birthplace, secondary centre, manioc & peanut birthplace, Vavilov, id., VII, 50

**botanic geography**, agriculture origin centres, South America, Peru, Bolivia, potato birthplace, second maize developing centre, Vavilov, VII, 54-55

**botanic geography**, agricult. origin centres, southern Mexico, Antilles, maize &

beans birthplace, Vavilov, VII, 54

**botanic geography**, agriculture origin centres Pampas, geography, climatology, botanic description, spring late frost threatens wheat, moisture favours rust, Vavilov, VII, 58

**botanic geography**, agriculture origin centres, Missouri, Indiana, Ohio, geography, climatology, botanic description, primary forest, ideal wheat climate, Vavilov, VII, 58

**botanic**, morphology & histology of plants organs, Malpighi, II, 29-30; Duhamel, II, 183-84, history of taxonomy, Duhamel, 179-83, Mitterpacher, III, 43

**botanic**, supposed similarity of vegetal seed and animal foetus, Malpighi, II, 31; Rozier, III, 93; end 18th cent., application to all vital phenomena of the supposed uniformity of vegetal & animal life, Rozier, III, 92-93; assent with some perplexities, Re, id, 294

**botanic, taxonomy**, tame spp. history, classification based on edible organs, De Candolle, VI, 10, history, unimportance unicity or plurality ancient etyma, id., VI, 9, unreliability glottologists' works, id., 9, mere presumptive value sources, necessity different sources accordance, id., 9, problems to be solved for the progenitors identification, id. 21, research of origin region, progenitors, following displacements, id, VI, 3, utilisation knowledge of botany, archaeology, paleontology, history, glottology, specific cautions for every source, id. 5, analysis predecessors mistakes, id., 6-7, recognition result: origin place of 247 spp., whose only for 169 progenitors were identified, id., 21-23

**botanic, taxonomy**, herbaria composition & plant classification, intensification during 19th cent., VI, 1, Darwin's role, id., 2

**botanic, taxonomy**, classification first need for knowledge II, 180; guidelines of the systems composed until Linnaeus, Duhamel, II, 181-82; achievements & limits of Linnaeus system, id., 182-83; research families bound in natural parentage, id., 182-83; research of phylogenetic connections, Gallesio, III, 271-73; need to distinguish vegetables on the base of physiological traits, the Jordan's contribution, Vavilov, VII, 39-40, to arrange evolutive groups from the same original area on the foundation of ecological guidelines, id. 40

**botanic, taxonomy**, homologous series law, each & every family shows a range of characters differently combined in the single species, Vavilov, VII, 41-42, application to *Leguminosae*, id., 41, questions about origin each trait from common progenitors or from later mutations, id., 42

**botanic**, botanical & "agrarian" gardens, foundation dates in Italy & other European countries, Niccoli, VI, 234

**chemistry**, the matter constitution, Aristotelian doctrine of 4 elements, I, 196; the element nature, Lucretius, I, 47; Aristotelian & alchemistic matter contraption demolition, Boyle, II, 5- 6

**chemistry**, 18th century end, doctrines' clash, III, 84; re-proposition of 4 elements Aristoteles' physics, Rozier, III, 84, inclusion CO<sub>2</sub> in peripatetic physics, Rozier, id., 87, fanciful arrangement between new knowledge & phlogiston doctrine, id., 86; obscure lucubrations about fire's & water's nature, id., 88-89; confusion among salt, acid & alkali, id., 89-90

**chemistry**, putrefaction, hydrogen emission, De Saussure, III, 207; Liebig's fermentation/putrefaction hypothesis, the acrimony against Pasteur's discoveries on fermentation, V, 21

**chemistry**, multiplicity Davy researches on the footsteps of English agronomists, III, 279, the 49 elements identified in 1813, id., 282, first knowledge about organic ternary compounds: cellulose, starch, sugars, acids, greases, waxy, resins, stoichiometric formulae, id., 283-84, dubiousness notions about quaternary (C, O, H, N), id., 284; procedure for analysing vegetal compounds, id., 285

**chemistry**, history, the Aristoteles doctrine on matter, Liebig, IV, 33, the alchemy laboratory discoveries, id., 33, the invidious aloofness for Lavoisier's prestige, id., 34 Liebig's contests with every success chemist & microbiologist, IV, 32

**chemistry**, middle 19th cent, laboratory procedures, De Gasparin, IV, 191-195

**chemistry**, new knowledge of key compounds in agrarian produce, Boussingault, IV, 49, analysis flour proteins, id., 49; progress 1843 - 1875, V, 292, first proteine analysis, id., 292, starch, properties, enzymatic scission, Payen, Boussingault, IV, 50-51, tryglicerides, composition, analysis, fatty acids separation, id., 51-52

chemistry, 19th cent. acetylene & urea synthesis, first organic compounds produced artificially, Arnaudon, V, 295

**chemistry**, Voltaic bow process' patent, Haber-Bosch 1910, VII, 365

**economic history**, hunting & foraging economy, review wild spp. whose seeds had been reaped in Africa, Harlan, VII, 325-26; Wadi Kubbania 20.000-15.000 b.C., vegetal remains & human coprolites demonstrate diet Paleolithic hunters on the Nile riversides, ample resort to marsh tuberous species, Hillman, VII, 320-21, Peninsula de Paria, Venezuela Caribbean coast, 4.000 a. C., economy based on molluscs from mangrove littoral & back-forest resources, Sanoja, id., 321-22; Thailand, Khok Phanom Di settlement, gulf of Siam, between 4.000 & 1.125 b. C. shows mollusc consumption in quantity sufficient to suggest permanent staying & population increase, in measure to compel creation of satellite villages, till the choice of rice cultivation & induction social stratification, Higham, Maloney, id., 322

**economic history**, supposed necessary correlation between stone-building & vines, olive & fig tending, Hehn, VI, 31

**economic history**, Athens, the agriculture place in the society, Xenophon, I, 26

**economic history**, Rome conquest economy, I, 62-63

**economic history**, slavish work, peculiarities & antinomies, Columella, I, 64, necessity to treat slaves with the cares due to production tools, id. 64; Smith, II, 322-23

**economic history**, latifundia in Roman Italy, genesis, Toynbee, I, 35, 44; role in the Empire's decline, Pliny, I, 129

**economic history**, Islam, economy development in the early Middle Ages, I, 162-63

**economic history**, sharecropping, creation in communal age for the peasants spoliation, Poggi, IV, 141; against a contract rooted in the centuries the need of an eversive law, id., 147-49; which, on hills where production is exiguous, must convert the métayer in owner of the land he works, Poggi, Ridolfi, id. 150

**economic history**, 16th cent. Po Valley dairy, cheese economic role, I, 323, local peculiarities, id. 323-24; complementarity of plain meadows and Alps pastures, Gallo, id., 324, production cycle counter-parties, id., 325, Swiss alps role, id., 326-27 option between cheese prod. & calves fattening, Gallo, I, 325-26

**economic history**, the 16th cent. prices revolution I, 278

**economic history**, 16th century Great Britain, paeon of land under individual power, Tusser, I, 269-70; declaimed commons sterility, Tusser, id., 269; Bloch, id. 266; succession Parliament acts, Van Bath, III, 33; economic & social benefits of enclosures, Young, id., 33-35, fancied impulse to population growth, id. 35; demonstration of countryside depopulation, T. More, III, 35-36

**economic history**, *gabella* (foodstuffs excise system), linchpin of Middle Ages & Ancien Régime political systems, II, 262-63, basic tasks, id., 262, 265; emblematic codes, id., 263, miller's appointment as a tax collector, id., 263-64, peasant's duty to use one only mill, id., 264, legal determination of the route to follow, of the composition of foodstuffs' mixture, id., 265, ties strictness makes it difficult to prevent famines, id. 265, import's formalities in case of shortage, id., 266; production hindrance in areas of scarce population, Bandini, II, 269-70, in Maremma (Tuscany) free trade necessity to increase production, id., 270

**economic history**, Dark Ages-Early Modern Era, tithes for clergy, cause of embezzlement for impossibility of collectors' control, Smith, II, 314

**economic history**, cadastre Italian tradition from Middle Ages to 19th century, tribute invariability as a incentive to estate improvement, Verri, II, 294; Great Britain, same effect of estate rent tax, Smith, id., 313; unavoidable damages in Italian Mezzogiorno



from estate tax unadvised equalization, Sonnino, IV, 200; the parliament debate on the law-text, id, 201

**economic history**, colonial spices, 17-19th centuries, Dutch expedients to check exports & rise prices, Smith, II, 324

**economic history**, 17th cent. England, adventurer reports contribution to the challenge for mercantile supremacy, II, 296-97; fine tuning between scholars & political rulers, id., 297-98; III, 4-5; the accordance promotes birth of economic & social sciences, II, 295-96; vastity of economic memorials consulted by Malthus, III, 488

**economic history**, 17th cent. England, necessity to enlarge & improve rural industries, Weston, II, 19, basket production, utility to diffuse best osier varieties, id., 19

**economic history**, New England settlements growth fruit of free farmers society in a land where illimited fields availability balances population increase & food demand, Smith, II, 318-19, English colonies prosperity in comparison with Spanish ones, Smith, II, 317-20, food production foundation colonial stuffs cultivation, id., 320, relationship wheat/meat prices, id., 320; need to improve agricultural practices in tropical colonies, Weston, II, 13

**economic history**, 18th cent., agriculture development condition for general prosperity, Muratori, II, 139-40; Bandini, id., 269-70; Quesnay, id., 271; countryside wealth condition for liveliness of urban & manufacture economy; industriousness difference among peasants of various countries, produce volume depending on industry, Muratori, II, 100, necessity to educate peasant & owners, whose ignorance is even graver, to improve production, id., 101; Young, Pitt, III, 38-39

**economic history**, agriculture taxation, the main resource of State treasure in country regions, Bandini, II, 269; the harmful survival of tithe, id, 269; a disproportionate drawing & a hindrance to land improvements, Smith, II, 314, wealth trasfer to an unproductive class, id., 314, for the ampliude of interested regions oriental rulers' tithe is an incentive to build roads & canals, id., 315

**economic history**, physiocracy, trade liberty the best treatment for economic disorders, Bandini, II, 267, any control system is less efficient than liberty, id., 270; market liberty pre-eminent civil imperative, Quesnay, II, 275; Beccaria, II, 286, any need satisfacion is guaranteed by price automatism, id., 287, market multiplicity ensures the wheat price equilibrium with the minimum of public intervention, id, 287-88, political geography, economic regions & political borders, id., 286, higher the customs duties higher the incentive to smuggling, id., 287, the sacrality of private property, id., 286; free exchange liberty prosperity's foundation, Ridolfi, IV, 262

**economic history**, 18th century, agriculture, the only real wealth source, Quesnay, II, 270-72, national budget, wealth flow from & to agriculture, id, 273-74, refutation trade primacy among wealth sources, id., 273, mercantilist policy conviction, id., 274-75; *Nuova fisiocrazia*, Solari, V, 167

**economic history**, distinction between *grande & petite culture*, Quesnay, II, 271; antithesis repropoed for Sicily, advantages *petite culture* for fruit-orchards, Sonnino, V 195-96

**economic history**, the higher productivity attributed to peasant farms, De l'Abbaye, II, 277; Onorati, III, 138; Poggi, IV, 148-49; lower productivity, social & political stability, Ridolfi, IV, 272

**economic history**, 18th century northern Germany Junker estates from a feudal organisation to economic business III, 239, need of floating capital increase for new management formulas, id, 241-43, costs to hold up for rising fertility to the point needed for new rotations, id., 242; 19th century Tuscany, from aristocratic *fattoria* to modern industrial concern, necessity of financial might, technical knowledge, commercial ability, Ridolfi, IV 328

**economic history**, 18th cent. England, diffusion meat consumption kindles animal husbandry, III, 21-22, 28-29; France, cattle number drived to Paris slaughter-houses, Tessier, III, 250

**economic history**, 18th cent., mercantile competition & gold circulation, II, 297

**economic history**, 18th cent., spreading of manufactures & trade, reduction agriculture role, II, 298; but only agriculture improvement can increase population, necessary for nation's might, Young, Pitt, III, 38-39; dependence general prosperity from manufactures & trade vitality, Ridolfi, IV, 264

**economic history**, economics foundation, origin in moral philosophy, II, 297; study of known phenomena on the guidelines of new criteria, id., 298; concepts of economic good & value, Smith, id., 300; confutation of Quesnay's claimed agriculture primacy, id., 300, different industries foundation, id., 300, emphasis on the role of merchants & manufacturers, id., 300, productive classes, exclusion of courtiers & clerics, id., 300, capital accumulation & division of labour, id., 300-01, national wealth, role accumulation, id., 301, the role assigned by Smith to agriculture, as a condition for every different activity II, 301

**economic history**, Smith's theorem on economic rent, the difference between food produced & consumed by workers, or between land produce & manpower needs, II, 301-02, functions surplus remaining after satisfying workmen needs, Smith, id., 302-303; De Gasparin, IV, 216; entity connected to people nourished by surface unity, id., 303, effect of technological & civil development, II., 304-05, animal husbandry development reduces difference between bread and meat prices, hence between relative rents, id. 305; the links among total surface, total produce, population number, id., 306, convergence of all crops rents to that obtained by the most common food, in Europe wheat, id., 306, if on the same surface potato can nourish more people, its rent will substitute that of wheat, id., 306 as in Asia does rice id., 305

**economic history**, economic rent, Smith theorem, forests do not produce any rent if transport costs equal produce value, II, 406, after nourishing the farmer marginal land do not leave any stock, hence any rent, unexplored regions products are not economic goods till they enter the circuit of trade, id., 309, transport improvement joins impervious regions to the markets creating new rents where none existed, id., 310

economic history, 18th cent., sugar market, scarcity of idoneous regions reason for monopoly profits, Smith, II, 321

**economic history**, vinyard rent, proportioned to investm. & annual costs, major than for wheat, Smith, II, 307-08

**economic history**, travels in France goals, Young, III, 7, 39-40, judgements on the report, Braudel, Kerridge, id., 7, 40

**economic history**, dairy, 18th cent. Lombardy exports volume, Amoretti, III, 71, the role of merchants in cheese ageing business, id., 73; 19th cent., butter exports entity, Besana, V, 304, difficulties for Parmesan-Reggiano export notwithstanding quality prestige, id. 305

**economic history**, different consumption attitude farmers & craftsmen, Galiani, II, 283; dependence agriculture produce prices from consumer salary level, Thaer, III, 239-40

**economic history**, bread weight & price, unimportance double authority's fixing, Beccaria, II, 289

**economic history**, 18th century, farm workers, for centuries payed in nature, receive a salary, which renew all the farm equilibria, compelling to utilize man's work only if it produces goods of major value than salary, Thaer, III, 239; high salary damages agricult., but favours marriages and births, wich re-establish equilibrium, Thaer, id, 240; contradictory wish of low salaries coupled with high price of agriculture produce, id. 240-41; comparison with Smith, id., 241

**economic history**, 19th Italy, sharecropping hindrance to agrarian progress, contract precariousness imposes rotations' immutability, id., 282, an assured land investment suggests renunciation to rentability, a true obstacle to agronomic improvement, id., 326; Cuppari, id, 374-75; sharecropping farm budgets clear proof of system inefficiency, Ridolfi, id., 326; contract precariousness paralyzes both the parts, Cuppari, id., 376, new conditions' proposal to allow new rotations' introduction, id, 376-77; the contract origin of the irrational exploitation of soil resources, Bertagnolli, VI, 209

**economic history**, higher price potential of typical local products, an insightful intuition Cuppari, IV, 392-93

**economic history**, 19th century Two Sicilies kingdom, the proposals to reduce number of wonderers & beggars, Genovesi suggesting to spread the acknowledgment that work ensures a revenue, Targioni to compell idle people to hard labour in "houses of correction", III, 151

**economic history**, comparison of triennial cycle with new rotations, Thaer, III, 225, comparison capitals invested in triennial system with those demanded by advanced systems, id., 237-38, 242

**economic history**, dairy, 19th cent. Mecklenburg, the leasing of stables & cattle to Dutch dairymen, Thaer, III, 219

**economic history**, the reasons for swine price fluctuations' frequency & amplitude, Thaer, III, 220-21

**economic history**, 1862 Liebig denunciation of the awful appropriation by Great Britain of all the globe's fertilising resources, IV, 35, 38-39

**economic history**, the human work considered as a machine labour, the ties by which, in successive civilisations, someone commanded other's workforce, De Gasparin, IV, 219, id., 222, manpower, division in classes depending on working ability, De Gasparin, IV, 220, worker salary must guarantee survival & reproduction, De Gasparin, IV, 220-221, high salaries threaten large estates, id, 221, birth number necessary to preserve workforce, id., 222, id., 222, correlation between family needs, computed in wheat kg per annum, & workable days number, id., 224, "natural" salary escludes any possible savings, id., 222, food necessity is first natural law, public help to poors alters natural equilib., id., 226; value foodstuffs for mere subsistence, having diligently calculated the monetary needs for survival and family's reproduction, De Gasparin blatantly states that ordinarily the worker can sell his labour all the 241 days necessary to earn that money, IV, 225, the "scientific" analysis of minimal vital conditions, Sacchi, V, 246

**economic history**, debate about wheat trade, exports being a prerogative of poor countries; import of industrious countries, Verri, II., 290; Ridolfi, IV, 264, advantage in exchanging wheat for manufactured goods, id., 263

**economic history**, in industrious countries craftsmen savings flow to agriculture, Verri, II, 290; agriculture development pushed by urban investments, Smith, II, 311-12; Bertagnolli, VI, 199

**economic history**, 19th cent. commodity markets, grain competition from Americas & Russia, effects, De Gasparin, IV, 185; Ridolfi's underestimate of steam-propelled transports, (trains, ships) IV, 306; crisis spike after 1870, parliament enquiries in Italy, G. Britain, Germany, VI, 153-54, political movements intervention, id., 154, judgment impossibility on the base Marx's categories, id., 155-56

**economic history**, 19th cent. Italy, after unity evidence of agriculture enormous regional differences, III, 301-02 bewilder a political class whose every member did know only the economy of his region, V, 82, in the confusion of parliament debate the only certainty of bourgeois and noble members is the necessity to coalise to protect their privileges, the will which inspires the parliament 1875 inquire on Sicily and 1877 on rural classes, V, 83, 171

**economic history**, 19th cent. Italy new economic frame would impose a new farmer class, Ridolfi, IV, 272

**economic history**, 19th cent. Sicily, for *giornatari* (journeymen), work opportunity at sowing & reaping time, for the rest of the year idleness & misery, Sonnino, V, 186

**economic history**, beginning 19th cent., starting new agriculture practices in plains practicable by machines, IV, 260 condemns the agriculture of hilly central Italy, Ridolfi, id., 265

**economic history**, choice of nitrogen content as a meter of agrarian resurces & produce value, De Gasparin, IV, 159-160; contradictions, id., 161-62; a later reproposal, Marconi, V, 253

**economic history**, the debate about Smith's rent theory, based on division of earth produce between owner & tenant, II, 302; Ricardo, difference between various land fertility, Say, lease of natural resources, De Gasparin, IV, 216, comparison theses Smith, Say, Ricardo, IV, 215-16, proposal of a new theory, id., 216, the daily worker's labour base of rent's computation, id, 219

**economic history**, 19th cent., economic rent theory, presumptuous lucubrations about contradictions among major authorities, B. Pichat, V, 94-95; refusal of the concept from Marx, who defines it "excess profit", Kautsky, VI, 161

**economic history**, 19th cent., human work considered as the labour of any machine, De Gasparin, IV, 174, 221; Poncelet, Brusotti, V, 260

**economic history**, manufacturing & reproduction processes, Thaer, III, 210, application to agriculture of manufacture principles id., 210; conversion agriculture into manufacture, the myth of Ville on *Le Figaro*, Gautier, V, 153

**economic history**, 1934 China, creation first fertilizer factory, VII, 434

**economic history**, 20th cent., the entrepreneurial peasant habits display in old share-cropping regions, like Tuscany & Emilia, V, 204

**economic history**, 1960' - 80' S U, Vavilov genetic programs interruption imposes import from America of 80 million t cereals/yr, VII, 49

**economic history**, 21th century backward agriculture in Africa & South America, CIMMYT improving essays, critical analysis of past projects to define strategies able to kindle peasants' participation, exemples project Oaxaca, Mexico & Guatemala to stop soil degradation, VII., 358-59; identification ideal traits for maize suitable in southern predesertic Africa, id., 359; new maize varieties show fields in Tehuacán Valley with seeds offered to *campesinos* in exchange *kilo por kilo* with old landrace crops, VII, 358,

**economic history**, 21th century fruit markets, other continents competition threatens European produce, the only defence being genetic research, Sansavini, VII, 490

**entomology**, phytofage insects, remedies: naked menstruating woman crossing the kitchen garden, Alamanni, I, 245; Tarello, I, 343; first rational procedure to get rid of a pharasite, De Serres, I, 390-91; account of regional infestation of *Sitotroga cerealella*, Duhamel, II, 165-68, investigation of vital cycle to conceive an eradication plan, id. 172-74; middle 18th cent. knowledge status, II, 166-67; middle 19th cent. insect cycles knowledge, Lessona, V, 248-49

**entomology**, necessity of insects' knowledge to exploit useful properties, Weston, II, 18

**entomology**, *Dacus oleae* diffusion & damages Giovene, Lavazzeri, III, 70; morphology, biology, strategy for containment, Caruso, V, 231-234; experiments in Greece with "traps" of attracting compounds mixed wit insecticides, Orphanidis, VII, 107; check of Parathion effectiveness, Russo, VII, 107

**entomology**, *Diaspis pentagona*, research of a natural enemy, finding of *Prospaltella*, Berlese, VI, 150

**entomology**, *Hyphantria cunea*, for exceptional proliferation forest treatment with DDT, Petrick, VII, 108

**entomology**, *Melolontha melolontha*, morphology, vital cycle, damages, Lessona, V, 249-50; future disappearance in the new countryside environment, V, 250

**entomology**, *Perycheria purchasi*, research of a natural enemy, the finding of *Rodolia cardinalis*, Berlese, VI, 151-52

**entomology**, phytofage insects, predator enemies, Réaumur, II, 158; Ginanni, id., 158

**entomology**, 18th century, Angoumois *Sitotroga cerealella* infestation, differences from other *Tineae*, Duhamel, II, 167, infestation, analysis hypotheses imagined about origins, id., 169, observation of seed penetration, growth, first flying of new moths, id., 170-71, mating, eggs laying, hatching observation, id., 169-70, the study of cycle in the granaries and in caryopses ploughed into the soil, id., 170, the complete cycle between fields & granaries id., 170-171, methods experimented to disinfect wheat, comparison, id., 172,

disinfestation seed crop with lye, id., 172-73 disinfestation milling wheat in a oven, id., 173-74, necessity general treatment all of the region crop after threshing, id., 175-76 to stop proliferation rules proposed for public policy, Duhamel, id.174-75;

**entomology**, 18th cent. *Dacus oleae*, Lombardy, prescription for general olives pick up to eliminate wintering flies, Giovane, Lavazzeri, III, 70; damages in Mediterranean olive producing regions, Caruso, V, 231-34

**entomology**, *Phylloxera vastatrix*, the first point out, the propagation, damages, A. T. Tozzetti, VI,136, vital cycle, phases & metamorphoses, id.,136-40; Grassi, VI, 140; useless of endeavours tried to hit the parasite, which seems unreachable, Cossa, VI, 140

**farm frame & economy**, criteria to choose the best location, Columella, I, 60; Palladius, I, 145; Crescenzi, id., 198-99; Estienne, id., 248; De Serres, id., 379

**farm frame & economy**, knowledge & ability needed by the owner, Columella, I, 60; his moral duties, De Serres, id., 379, 438; capability, Onorati, III, 141; Thaer, id., 189-90; De Gasparin, IV, 182; entrepreneurial mind, Ridolfi, IV, 327-28; basic knowledge of agrarian legislation, Rabbeno, V, 253

**farm frame & economy**, the steward, gifts & duties, Cato, I, 34; Columella, id., 64; Crescenzi, id., 199; Alamanni, id., 243; Heresbach, id., 352

**farm frame & economy**, management, Cato, I, 35; Columella, id., 64; Crescenzi, id, 199-200; Mortimer, II,70; Mitterpacher, III, 60; De Gasparin, IV, 213-14

**farm frame & economy**, evolution in Roman world, Toynbee, I, 35; Bertagnolli, id., 36

**farm frame & economy**, drawback of running by sharecropping (*masseria*), Gallo, I, 275, 281, benefits of personal management, id., 282; De Serres, id., 379, 438

**farm frame & economy**, ideal fields shape, Alamanni, I, 242

**farm frame & economy**, the necessary equipment, Alamanni, I, 243; harrows, roll-harrow, De Serres, I, 380; necessity to improve farm equipment effectiveness for the best economic performance, Weston, II, 15, 20

**farm frame & economy**, conception, influence of Calvin doctrine, De Serres, I, 441-42

**farm frame & economy**, computation of draught animals need, Thaer, III, 189-90, want of manpower, id., 190

**farm frame & economy**, relations with salaried workers, De Serres, I, 439-40; the discipline as an imperative need, Thaer, III, 190-91; De Gasparin, IV, 173, 181

**farm frame & economy**, from the medieval physiognomy to the modern one, I, 437; Prussia, adoption new rotations, investment necessity, Thaer, III, 225; financial burden for the new crop cycle, id., 237-38; Tuscany, Cuppari, IV, 382-83; patrician latifundia proof backwardness agriculture, capitalistic farm proof of progress, Ridolfi, IV, 271, transition from agriculture for family consumption to entrepreneurial business for the market, id. 272

**farm frame & economy**, documents, first of all a geometric plan, the topographic instrument to identify the elements of the juridical-economical situation (rights & investments) of every field registered on the estate book, Thaer, III, 244, fields plan, cultivation register, id., 244, cash & storehouse recording, annual budget, id., 245; De Gasparin, IV, 181-82

**farm frame & economy**, functional factors & reciprocal relations, Thaer, III, 189-90; entity definition of real estate, livestock, circulating capital, id., 241-43; fixed & circulating capital, salaries, De Gasparin, IV, 181, 182; schema for technical & economic analysis, Cuppari, IV, 386-88

**farm frame & economy**, bookkeeping, necessity appraisal produce destined to farm utilization, Thaer, III, 245; Ridolfi, IV, 325, estimate manure potential let after a crop, id., 325

**farm frame & economy**, exemple of conversion of a piece of countryside in a farm with ditches & lines of supporting-vine trees, costs calculation, Cuppari, IV, 379-80, introduction rotation, cereals and forages, animal number, manure quantity, id., 381-82, buildings necessary for produce & manpower, id., 382, invested capital, annual budget, economic rent & business profits forecast, id., 383

**farm frame & economy**, the manager, knowledge, necessity clear agreement about future investments, Thaer, III, 242-43; De Gasparin, IV, 181; professional competence, Cuppari, IV, 386

**farm frame & economy**, new farm physiognomy deduced by Rothamsted researches, theoretical summary of Agrarian Revolution, Gilbert, VI, 129-134, fertility elements entity transferred to market imposes to buy fertilizers on the market, id., 132, farm as a vital organism regulated by economic & biological laws, id., 133, capital role of correlation between total organic produce/sold products & that between mineral elements absorption/mineral elements restoration, id., 132

**farm frame & economy**, *villa rustica*, last Republica centuries, the estate-type created after the Zama battle to exploit the immense number of slaves brought to Italy, hypotheses about oriental precedents, I, 36, 62-63; frame and running criteria Carandini, id., 63-64; Columella, id., 64-65

**farm frame & economy**, *villa rustica*, architecture, Crescenzi, I, 198-99, care for orientation as regards the winds and the sun, id., I, 199; the complex must be comprehend three independent buildings & yards: seigneurial, productive, for storages, Alamanni, I, 242; the same tripartition in Heresbach, I, 351-52; the functionality required by productive part, id., 352-53; the dimensions, De Serres, I, 379

**farm frame & economy**, *villa rustica*, 17th century, the sumptuous seat of aristocratic holidays, I, 463-64

**forage cultivation**, forage mixtures, Columella, I, 79, winter "catch crops", 79-80; composition, times, cultural technique, Ridolfi, IV, 292, absurdity to deplete fallow fertility with "catch crops" at following wheat expense, id., 293; types & cultural practices, Cuppari, IV, 373

**forage cultivation**, characteristics of natural & artificial pastures, De Serres, I, 387, artificial meadows irrigation, id., 388

**forage cultivation**, lucerne, cultural practice, Columella, I, 79; economical role in Lombardy, Gallo, id., 291, 297-98, history of re-introduction in Italy, id., 297, soil choosing, seeding preparation, id., 297, hay making expedients, id. 297, green feeding, wilting necessity, id., 298, seed harvest, id., 298; origin & history, De Serres, I, 388, nourishing properties, green & hay-made, id., 389, field preparation, 16 months cycle, id., 389, rejection of superstitions about seeding, id., 390, expedients against fitofage caterpillars, id., 390; criticism of Columella's teaching, Tull, II, 94; benefits by deep root system, poliennial cycle, produce entity, Thaer, III, 218; Ridolfi, IV, 291

**forage cultivation**, red clover (*Trifolium pratense*), 16th cent. Lombardy, cultural practices, sowing together with wheat, Gallo, I, 296; economic role, relation with intensiveness of land exploitation, id. 279, time for sowing in seeded rye, id. 296, 17th cent. England, need of diffusion, Weston, II, 17; role in agrarian economy, best suitability dry soil which must not be lose, Young, III, 21-22, 217, benefits from a luxuriant crop for following wheat id, 26, damages from the contrary, id., 22, comparison advantages hay-making & pasture, id., 22, seed quantity need, id., 22; Mortimer, id, 65; benefits for animal husbandry & for cereals in succession, Thaer, sowing in buckwheat and flax, Thaer, III, 217, better seed production from the aftermowth of the first harvest, id., 218; Ridolfi, IV, 283

**forage cultivation**, white clover (*Trifolium repens*), Lombardy, place in 6 yr rotation: 1 flax & sorgum - 2 wheat, 3 - wheat - 4-5-6 clover, Amoretti, III, 67; '800; Zanelli, V, 219

**forage cultivation**, 18th cen. Lombardy, artificial meadows, permanent, irriguous & *marcite* (water meadows), white clover *spianata* [level field], dry or irrigated, Amoretti, III, 66-67

**forage cultivation**, 17th cent., tap-root species, turnips, key role in Low Countries, Weston, II, 17, multiplicity & deepness of works ameliorate the status of earth, Young, III, 18, place in the rotation interrupting the succession of cereal crops, id., 24, comparison with different spp., id., 24-25, base of winter feeding, pillar of new animal farming, id.,

23-24; culture practices, Thaer, III, 214, transplant from nursery, id., 214; spp. review, place in rotation, culture technique, Ridolfi, IV, 293

**forage cultivation**, 18th cent. England, new forage role, Mortimer, II, 65; fodder place in the "new agriculture", Tull, II, 88-90

**forage cultivation**, sainfoin (*Onobrychis viciaefolia*), cultivation cycle according to "new agriculture", Tull, II, 88-89; suitability to clayey soils, cultural practices, Ridolfi, IV, 292

**forage cultivation**, meadow, spp. classification depending on environmental attitudes, Mitterpacher, III, 51; natural & artificial species association, Thaer, III, 206-07, cultivation procedures, id., 207-08, artificial prairies, main spp.: Italian ryegrass (*Lolium italicum*), perennial ryegrass (*Lolium perenne*), orchard grass (*Dactylis glomerata*), tall oat grass (*Avena elatior*), timothy (*Phleum pratense*), id., 218, hay-making, times & expedients, id. 207-8, mowing advantages waiting grasses maturity after full blooming, Alamanni, I, 237; Tusser, I, 261, grün Heu, & braun Heu, Thaer, III, 208, red clover, haymaking by fermentation, Klapmeyer method, id., 217; natural meadows & spp. association, Cuppari, IV, 377; artificial meadows, temporary, permanent, dry, mixed, irriguous, id., 371-74; Zanelli, V, 219;

**forage cultivation**, culture necessity to restore survived natural meadows, practices, Ridolfi, IV, 291-93

**forage cultivation**, natural pastures, place in the new husbandry economy, Thaer, III, 206-7, in the rotation frame, id., 208-09, classification on the base of productivity, id., 209, surface necessity for every animal head, id., 209, heads excess causes the turf decline, id., 209

**forage cultivation**, 19th cent. Italy, need to enlarge meadow land, Re, III, 298

**forage cultivation**, 1893 Rothamsted, tap-root species, Norfolk turnips, Swedish t., in monosuccession without fertiliz. dramatic productivity fall after first years, Gilbert, VI, 93, in rotation fertilized plots produce the same yield that after fallow or clover, id., 114, Norfolk t. (*Brassica rapa*) confirms benefits for the organic production to be brought to stables, id., VI, 92, dependence high yields from N availability, same behaviour Swedish t. (*Brassica rutabaga*), id., 93,

**forage cultivation**, Lucca, permanent irriguous meadows province's peculiarity, Cuppari, IV, 377

**forage cultivation**, 1950 Italy, research about relation between forage cultivation & fertility, tests on new fodder species notwithstanding decreasing farmer interest for traditional forages, Hausmann, VII, 85-86

**forage cultivation**, 1959, hay quality depends on harvesting cares, Baintner, VII, 88

**forage cultivation**, 1959 Soviet Union, need to choose best pasture spp. in immense steppe flora, program to create drainage network in pastures & promote fertilizer diffusion Andrejew, VII, 86

**forestry**, wood need by economy & maritime might, De Serres, I, 424; Weston, II, 12, 19; Evelyn, II, 56-57; Mortimer, II, 64 - 71; capital role for economic & civil life, Duhamel, II, 178-79, 191, 196; Mitterpacher, III, 55; Ridolfi, IV, 320-21; increasing demand during 18th century to satisfy charcoal and timber necessity of new manufactures, Braudel, Duhamel, II, 179, to increase availability necessity to convert timber from a natural produce to a cultivation's crop, Duhamel, II, 179, a choice that would also restore the environmental value of vast mountainous neglected areas, id. 179

**forestry**, timber properties dependence by species, Al 'Awwâm, I 178; hardness, correlation with species' longevity, id., 178, influence of region and terrain of origin, Duhamel, II, 202, influence of felling season on density, id., 204, market evaluation of different age coppices' yield, and, for the same age, different assortment, the condition for the manufacture destinations, id, 200 produced article categories, id., 201-02

**forestry**, need of legislation & forest governance, Weston, II, 19; France, *Ordonnance Royale*, Duhamel, II, 194-95, duty to preserve in the coppices trees *de reserve*, id., 194-95,

authority licence for felling high-wood, id., 202, proposals to update the discipline, id., 195, reasons to change the rate of high trees the *Ordonnance* prescribes to leave in a coppice, id., 195

**forestry**, criteria to assess wood's physical properties, Duhamel, II, 204-06, the earlier the trunk would be converted into pieces the less the timber alteration by drying, id., 206

**forestry**, 16th century Spain, claim against the irrational forests exploitation, Herrera, I, 221; necessity to watch vagrants for the danger of fire, Duhamel, id., 194, damages by free grazing, need to enforce policy discipline, id., 194

**forestry**, coppices, economy, De Serres, I, 425; growing length proportioned to fertility, Duhamel, II., 192-96, the choice of the felling cycle, increasing destination value by age, id., 199-202, 207; value of utilisation dependence on species & diameters, id., 201; coppices economic advantages in populous regions, high-wood forests in impervious regions, Ridolfi, IV, 321, change in convenience after new roads construction, id., 321; coppices, wood conversion into charcoal, Duhamel, II, 201-02; Monselise, V, 317

**forestry**, high forests, timber for shaping gun-carriage pieces, Duhamel, II, 207, lathe-works: bowls, wheels, id., 208, trunk cleaving works: galley oars, barrel staves, roof tiles & hooped frames for sieves, the clog manufacturing, id., 207, rasp works: cheese hoops, oven shovels, wooden spoons, poles for stirring, id., 208

**forestry**, timber from high forests, cuts for shipyards, differences among national traditions, Duhamel, II, 208-09, squared timbers: "straight", "curved" and "plank" timbers, id., 209, plank timber, working procedures, id., 209-10

**forestry**, wood plantation, previous soil quality survey, De Serres, I, 424-25; Duhamel, II, 191, 193; nursery disposition, De Serres, I, 424; Duhamel, II, 193-94; species choice, De Serres, I, 424; Mitterpacher, III, 55; plantation through ploughing & seed distribution, Duhamel, II, 193; Mitterpacher, III, 55, replanting of a high tree wood after felling, id., 195

**forestry**, timber, felling seasons, influence on quality by moon phase of felling day, Alamanni, I, 242; Gallo, I, 283; firewood when moon is waxing, timber when is waning, De Serres, I, 425; the poliennial plan of strength tests on wood felled in different months under a different moon phase, without verifying any difference, Duhamel, II, 205; re-proposition of old beliefs, De Gasparin, IV, 171

**forestry**, selling, wood mass evaluation before felling, Duhamel, II, 199-200; high forests: between the landowner and craftsmen who utilise timber the decisive role of merchant-buyer, who will resell every trunk to a craftsman specialised in a specific production; coppices exploitation, value dependence on age, varieties & diameters, Duhamel, II, 199-200, utilisation wood felling byproducts, De Serres, I, 425

**forestry**, France, most common spp., Duhamel, II, 193, 202

**forestry**, pine, characteristics, Duhamel, II, 202

**forestry**, oak, the diffusion in French forests, its economic importance, Duhamel, II, 193, the shipyard officials care to choosing timber from southern regions, id., 198

**forestry**, chesnut, *Castanea sativa*, fruit utility, wood's properties, Evelyn, II, 58

**forestry**, fallen leaves removal to use as litter undermines soil fertility & wood productivity, Ridolfi, IV, 320

**forestry**, wood distillation in autoclave, process, compounds obtained, Monselise, V, 317

**forestry**, in tropics conversion into plantation imposes to foresee soil evolution, existing luxuriant forests on poor soils, Van Baren, VII, 91

**garden**, Palestine, the vineyard, *Book of Kings*, I, 15; correlation with stone buildings, *Book of Kings*, I, 15; vegetable variety, *Odissee*, I, 19; place in Arabic agronomy, Al 'Awwâm, id., 161, 163, 177, cares for disposal of trees depending on affinity, id.177; 16th cent. France, *le jardin* (*potager, bouquetier, medicinal, fruitier*), De Serres, I, 413-14, 418-19

**garden**, soil choice, water availability, Alamanni, I, 243 spade work, advice for the best results, Alamanni, I, 243; Mitterpacher, III, 52



**garden, kitchen vegetables**, cultivated spp., multiplication after geographical discoveries, Alamanni, I, 244-45

**garden, kitchen vegetables**, strawberries, Gallo, I, 308

**garden**, flower cultivation, catalogue tended species, cultivation practices, Gallo, I, 308; De Serres, id., 418-19,

**garden, kitchen vegetables**, forced cultivation, use of horse- manure, id, I, 417-18, asparagus, Roda, V, 222-23

**garden, kitchen vegetables**, beginning 19th cent. Italy, market spp. cultivated at Varese, Dandolo III, 320; Milan, Berra, id., 321; Cremona, Bellò, id., 321; Mestre (Venice), Fappani, id., 321

**garden, kitchen vegetables**, tomato, 1959 Italy, programs for selecting new breeds, Barbieri, VII, 81

**garden**, layout, Renaissance, Gallo, I, 273, 303; De Serres, id., 418; 18th century, France baroque, La Quintinye, II, 34; 19th cent. Europe, Roda, V, 222

**genetics, precedents**, transmission of parental traits from parents to offsprings, *Genesis*, I, 1-2; doctrine of casual generation & "*generatio ex putre*", generation from matter putrefaction, Theophrast, id., 30; creatures are generated by parents, Lucretius, id., 48; Al 'Awwâm, id., 178; confutation "preformation" theory, Mitterpacher, III, 43-45

**genetics, precedents**, supposed human power on mating product, *Genesis*, I, 5; Aristotle, Columella, id., 118; mental models for the parents choice, id., 111; theoretical hypotheses, Al 'Awwâm, id., 186

**genetics, precedents**, reproduction forms, Theophrast, I, 29-30; Varro, id., 43; Virgil, id, 51; Al 'Awwâm, id., 178; Alamanni, id., 235; variability plants born by seed, Duhamel, II, 192

**genetics, precedents**, Aristotle & Theophrast "humours concoction" theory, I, 31; seed properties, peripathetic doctrine, Crescenzi, I, 200

**genetics**, man's ability to reshape vegetables & animals by crossing & selection, Columella, I, 114; Alamanni, id, 244-45; Weston, II, 17; Leichester sheep, Bakewell, Young, III, 28-30, Cheviot sheep, Young, id., 30; Sarda sheep, Mitterpacher, id, 56; Gallesio, id, 344-45; monstrous nature of selected breeds, Ridolfi, IV, 297; review hypotheses in agrarian literature, V, 103; man fosters generation of mutants & keeps them, Darwin, V, 103-04; dubiousness of first phenomenon, id., 107; man chooses varied individuals & reproduces them changing breeds characteristics, id., 106; review of explanations of millenarian man's endeavour to modify plants, Vavilov, VII, 59, irrigation & fertilization would foster mutations, id, 60

**genetics**, conjectures on variability of potato plant from seeds, Thaer, III, 215; genetic variability, De Dombasle, Ridolfi, IV, 294

**genetics**, combination parental traits in hybrids, Mitterpacher, III, 45; species & hybrid definition, Gallesio, id, 269-271; impossibility to foresee combination effects at first generation, id, 271

**genetics**, stability & variability of parental traits, Gallesio, III, 269-70; characters transmission to the progeny, doubts & objections, the prooves, Darwin, V, 119, variability, same parents generate different individuals, id, 119-20, the new traits arising & reproducing, id, 120, in wild condition, or free mating, crossing produces unceasing redistribution, id, 126, free intercrossing of different breeds would, in subsequent generations, impose the survival of the fittest, id, 126, whilst protracting selection (controlled mating) may stabilize new races, id, 126

**genetics**, role of species prolificity upon the time to obtain selection results, Darwin, V, 112, differences from progenitors are ampler in civilised societies, id, 123, selection reduces variability & for so future potential, id, 125, questions about inbreeding limits & human manipulation potential, id, 125

**genetics**, traits variability, consequence of exchanges at seed origin, Gallesio, III,

269, effect of two characters crossing, id, 270

**genetics**, agamic reproduction, continuous multiplication of the same individual, Gallesio, III, 271, denial essential diversity from sexual reproduction, Darwin, V, 121

**genetics**, hybrids traits recombination in following generations, first observation review, Mendel, V, 137, arithmetic demonstration why trait combination in hybrid progeny may appear case-produced, id., 137, species choice condition for experimental crosses success, id., 134, Mendel's option of plurality alternative traits & cleistogamy, id., 134; methodology for peas crossing, id., 135, analysis possible interfering factors, id, 135, ascertaining homozygosity of plants chosen to be crossed, id., 135, choice of alternative traits, rejecting intermediate ones, id, 135, results do not correspond perfectly to mathematical theorem, increasing plants number they approach more and more theory, id., 138-39

**genetics**, experimental demonstrat. that hybrid individuals possess 2 different chromosome endowment, pure individuals 2 identical chromosomes, Mendel V, 143

**genetics**, distinction between dominant & recessive traits, Mendel, V, 137, crossing a plant bearer of dominant trait with a plant of same sp. of other sex, which bears correspondent recessives, only dominant appears in first progeny, id. 137, crossing among them first generation individuals recessive traits reappear in 1:3 ratio, id., 138, in an hybrid re-crossed progeny the 2 traits will follow to reappear, but the number of individuals of hybrid constitution will decrease in geometric progression, id., 141, at second crossing of an hybrid with 2 couples or more of dominant/recessive traits, the recessive will reappear independently at the same ratio, id, 141, following the rule one can forecast the series that will be obtained crossing individuals with different known traits, id., 141, demonstration that making a cross of individuals with different traits, results are identical if any trait is born by the male or the female, so proving that genetical endowment is equivalent in the 2 sexes, id., 143

**genetics**, 19th century, hypothesis of possibility to come back to primitive wild cereal types interrupting human nurturing, Poncelet, III, 96; the same supposition for animal breeds, Ridolfi, IV, 297

**genetics** (applied), 19th cent., first wheat British breeders, Hallett, Shirreff, V, 147

**genetics**, 1881 Flemming observes chromatin filament, VII, 3; 1887 hypothesis gametes formation, Weismann, id, 3; 1888 Waldeyer coins the word chromosome, id., 3; 1906, Mrs & Mr Morgan start studies on *Drosophila melanogaster*, the first creature whose entire genome will be decoded, id., 3; 1908, Hardy & Weinberg formula defining 2 traits, dominant & recessive, behaviour, id., 2; 1910, East defines polygenic characters, id., 7

**genetics**, 1898, De Vries & Correns independently publish comments to Mendel, a year later Tschermak-Seysenegg, a new science is born, VII, 1, the opposition of the standard bearer of Darwin's chemical chimerae, Galton, id., 1

**genetics**, 1903, Johannsen demonstrates possibility to create "pure" bean line, he will propose the terms of genotype & phenotype, VII, 2; 1908, Shull analyses the effects of maize allogamy, & obtains first homozygote lines, id., 6; 1911, Nilsson Ehle confirms possibility to create new gene associations, which develop in new plants, id., 3, he was the first to create new more productive crops, id. 4; 1912, East & Hayes devise the method to produce hybrid maize, id., 7; low productivity pushes Jones to experiment double crossing, id., 7; 1919, Hayes & Garber experiment a procedure to obtain synthetic lines, id., 7

**genetics**, 1913, new discipline included in the program of Ghent international agriculture conference., lecture by Vilmorin & Meunissier about foundation principles & application prospects, VII, 4-5

**genetics**, necessity to verify if new traits appeared in an individual by chance may be transmittable, De Vilmorin, V, 148

**genetics**, 1916-17, Wright & Fisher explain reproduction mechanisms influence on genetic population inheritance, the latter composes formulae to define the single gene behaviour, VII, 7; 1924, their formulae improved by Haldane, id., 8

**genetics (applied)** tools for the gene substitution: *Agrobacterium tumefaciens*, the re-

striction enzymes, the ligases, VII, 278-79

**genetics (applied)**, competition for discovered traits' agrarian & pharmaceutical exploitation, the role of chemical companies & parliaments, the first international convention, signed in Rio de Janeiro in 1992 faced a knot still unresolved, leaving the field to charlatans & scribblers VII, 279-80

**genetics**, 1926, applicat. to arboreal species, crossing 2 strains of mate apple with wild ones resistant to *Venturia inequalis*, VII, 11; 1959, smallness discipline achievements in fruit industry, Lecrenier, id., 65

**genetics**, 1931, studying meiosis in *Drosophila*, Stern demonstrates that chromosomes are chemical messengers of genetic traits, VII, 9; Creighton & Mac Clintock confirm discovery studying crossing over in maize, id, 9; 1934, Dustin discovers colchicine's ability to duplicate a chromosome, allowing polyploids production, & making good interspecific hybrid sterility, id., 9; Mützing utilizes mechanism to produce *Triticale*, id., 10; crossing rye with tetraploid wheat creates varieties able to reproduction, id, 10; 1930s Mc Clintock utilizes anomalies at maize meiosis to identify specific genes of the plant, id., 10; 1944, Avery, Macleod & Mc Carty demonstrate that chemical support to genetic information is deoxyribonucleic acid, DNA, , id., 12; application knowledge of chromosome structure on *Arabidopsis* & *Drosophila*, whose single genes are decoded, id, 277; correspondence of a morphologic or physiologic trait & a DNA segment discloses new prospects for vegetable breeding, discovery of segments which enhance gene expression, id., 277-78

**genetics**, after 1925 plurality researchers study mutants obtained by x irradiation VII, 9

**genetics**, DNA functions, 1953, discovery of chromosome chain shape, the condition to understand meiosis, mitosis, genes recombination, Watson & Crick, VII, 275-76

genetics, 1959, animal breeding, new horizons opened by DNA segments transfer & by population statistics, complementary know-how must integrate as yet realised in poultry breeding, Odriozola, VII, 86-87, essential task the knowledge of complete genomes, id., 87

**genetics**, new cultivar constitution through gene combination in lab., 1995 diffusion first maize, soya, rice, cotton, rapeseed g. m., first years debate about advantage entity, VII, 382, critics, f.e. Mann, object that better defence against parasites should not be reputed a true progress in productivity, id., 382

**genetics (vegetable)**: differences between laboratory processes & breeding tasks to satisfy needs of farmers operating on the market and those producing for the family, VII, 281-82, for the former hybrid seeds, with heterosis benefits, for the latter stable seeds, indefinitely reproduceable, 283-84, research of a methodology to create seeds in which apomixis excludes meiosis & genetic recombination, id., 284, improved seed distribution by Mexico government, id. 284; Cimmyt 2000, engineering of new genomes, research needed genes & better introduction procedures, Pellegrineschi, VII, 356-57

**genetics**, ancient germoplasm value, diffusion modern agriculture in underdeveloped countries threatens old ecotypes whose genes may be indispensable for future breeding, necessity to collect & classify them, Vavilov, VII, 39; supposed contradiction between cultivar improvement & old inheritance preservation; the chimera of Nature inviolability sentence to death for poor peasants, compelling them to cultivate varieties inadequate to family's needs; geneticists' conviction of possibility to preserve ancestral inheritance allowing poor region peasants to give proper answers to their needs, id., 363-64; necessity that primitive stocks safeguard in regions where substitution is more impelling be faced with programs as timely as organic, id., 364, 376

**genetics**, India, constitution Indian Council for Agriculture Research, breeding wheat, rice, maize, legumes, introducing parasite resistance, good nutritional properties, generally low yields, which one cannot judge due to breeding backwardness or poor conditions of areas future cultivation VII, 444-45

**genetics**, introduction genes for resistance to pathogens in traditional cultivars, a task

identified by Vavilov, VII, 44-45, 374; wheat, resistance mechanism against *Puccinia*, id. 45, typical Mendelian process: pathogen get over defences of varieties lacking of mechanism against the specific attack, Salamini, id., 373; advantages of resistance based on a plurality of genes, application poligenic resistance against *Puccinia*, id., 374, proves aleatoricity of defence based on only one gene succession rices created by Irri to resist *Nilaparvata lugens*, a parasite unknown to entomology in years '50, which became the first enemy of the crop, attacking all the cultivars with a monogenic resistance, unable to resist more than 3-5 seasons, Conway, id., 375, possibility to oppose new resistant strains depends on presence of unknown resistance genes in germoplasm collections, id., 375; for the virus-resistance proved effective the insertion in the plant genome of the gene for the synthesis of virus capsule protein, penetrated in a cell, the virus cannot get rid of its envelope, then to reproduce, a procedure applied with success against rice, potato, lucerne viruses, id, 376, equally functional insertion of RNA "shears," id., 376

**genetics**, genetically modified plants, 2006 decennial commercial diffusion first g. m. maize, cotton, oil-rape, soybean & rice, first 4 created by seed companies, rice by Chinese breeding, first 4 did bear only 2 lab-introduced genes, proving time entity necessary for creating a new g. m. cultivar; notwithstanding time and costs advantages are confirmed by farmers rapid adoption all over the world VII, 474-75; Phillips demonstrates that g.m. varieties have risen rate of annual yield improvement in Corn Belt from 2,8% in years '90 to 3,5% in successive decade; cost entity of every project explains why goals multiplicity in a number of countries for a plurality of species did not produce, at 2006, one only cultivar ready to diffusion, id., 476; Maggiore & Salamini outlined that varieties g. m. are expressions of a environmental revolution, because introduction of resistance genes allows a drastic reduction of biocide treatments, a proof of falsehood of claims of self professing environment tutors who fight genetics propagating in public opinion awful but groundless fears, id., 477-78

**genetics**, prospects for the new millennium, successes last 50 years obtained by rising harvest index, the fraction of organic matter reaped as caryopses, decreasing straw weight, wheat from 50 to 450 g/mq, in U.S. maize yield increased 0.92 kg/ha/yr from 50 years, Salamini, VII 467-68; theoretically one could even rise wheat yield enlarging spike dimensions or creating plants able to grow in major thickness, Skovmand, id., 468; with wheat hybrids, an endeavour attempted when today tools were not at disposal, a success would rise production of 20%, Grimanelli, id., 469; actual crops yield often do not correspond to their potential because of field unfavourable conditions, which may be faced introducing idoneous genes from wild parents, id. 469; Conway illustrates 3 rices projected at Irri for different conditions: for poor soils a perennial plant preadapted to symbiosis for autonomously providing N, id., 470; emblematic Adams project for a "new" bean: identified traits that do increase yield, corresponding genes were found in germoplasm collections & composed in plants built accomplishing the design, id., 470; denying statement of maize continuous progress Mann underlines that in U S max. yield in national competitions, with inputs at best level, dry matter product. is stable from 30 yr at 20 t., he is also sceptical about possibility to adjust physiology to increase dry matter synthesis, a purpose which would impose the "restyling" of dozens of genes, id., 471; first endeavours to create "new" plants would have produced frustrating results, cultivated plants would probably be close to biologic limits, id. 471; cereal yearly yield increase did swing from annual 2,5% in years '70, then reducing to regain a 2% in the new millennium, when global produce was inadequate to contain the 2007 price blaze, id., 472; limit carbohydrates production depends on slowness enzyme RuBisCo, charged to capture CO<sub>2</sub>, & high water quantity necessary to produce 1 kg organic matter, Mann cites projects to modify key process enzymes recongnizing that their performance depends on dozens of subservient enzymes, id., 473; Reeves relies on the possibility to reshape plant structure allowing for a new relationship with natural resources, id., 478; projects of Leibniz Institut show that results of future manipulation will be committed to improvement of mathematical modelling, id., 473

**genetics**, rice, China, Yuan Longping in Changsha Institute devised a procedure to create hybrid rice based on male-sterility, practice demands high manpower availability, but from years '70 hybrids reached 6,8 t/ha against 5,2 of national average, promoting diffusion, in years '90 they were cultivated on half of Chinese paddies, VII, 435-36; later Longping concentrated on heterosis crossing different rice species, obviating crosses sterility through a gene which restores fertility, in 1997 new hybrids reached 13 t/ha yield, id., 436

**genetics**, wheat, prospects for future decades, necessity to apply organs interrelation law through biometry, technologic tasks, utilization knowledge of growth phases, Vavilov, VII, 61

**history of science**, Greek conquest of Latin society, I, 40-41

**history of science**, Greek & Latin knowledge standard at the beginning of Rome decline, Pliny, I, 125-26; the process' proceeding, I 145

**history of science**, 16th cent., avowal of human knowledge inadequacy, De Serres, I, 433-34, acknowledgment of Bible scientific authority, id., 436

**history of science**, China, literates knew Western science thanks to father Ricci design, but plan was interrupted VII, 433; 1898 foundation Huazhong University, among the firsts in diffusing nature knowledge of Western matrix, chemical knowledge settled down only in 1934 with the creation of first fertilizer factory, VII, 434

**history of science**, 18th cent., Galileo's legacy in biological sphere, II, 21, 160, 242

**history of science**, 18th cent., forestry birth, Duhamel's manifesto, II, 177-78; reduction forestry history to Crescenzi, De Serres, Von Carlovitz, Niccoli, VI, 231

**history of science**, role De Candolle work in scientific culture, VI, 3

**history of science**, 19th cent., biological intuition, experimental genius, patriotism, religious belief in Pasteur's live & work, V, 5-9

**history of science**, 17th cent., identification Boyle's historical place, II, 6

**history of science**, 18th century, scientific knowledge & agrarian progress, III, 506

**history of science**, 18th cent., alliance with politic might, P. Leopoldo of Lorraine, II, 215, 229

**history of science**, Ginanni's embodiment of the 18th century scientist background, II, 150-51

**history of science**, 19th cent., Dokučev pedogenesis theory exemplar theorem of experimental science, VI, 71-72

**history of science**, 19th century, flimsiness definition of agrarian science, IV, 19; De Gasparin, id., 154-55, distinction among sciences cosmologiques, noologiques & agriculture, id., 156, the redundancy of the new definition attributed to agronomie, agrologie, "fitologie", id., 156-57

**history of science**, succession of publication dates of Mendel & Darwin works, V, 118, 129

**history of science**, 19th cent. Italy, chemists' incapacity to choose between Pasteur & Liebig, Mitscherlich, Berzelius, V, 292; claim of Pasteur & competitors theses' equivalence, Besana ipocrisy, V, 292

**human alimentation**, cereal nutritional power & individual consumption, Egypt, *Genesis*, I, 11; worker's family (4 people), De Gasparin, I, 77; Braudel, id. 77

**human alimentation**, beer, consumption in Gaul & Spain, Pliny, I, 144

**human alimentation**, *Leguminosae* seeds for human consumption, nutritional similarity to meat, Thaer, III, 214

**human alimentation**, wine, physical & psychical unhealthiness, Herrera, I, 229-30; benefits of rational use, dangers from excess, Chaptal, III, 127

**human alimentation**, Bolognese recipes utilizing swine meat, Tanara, I, 474

**human alimentation**, fruit preserve recipes, Al 'Awwâm, I, 164; De Serres, id, 428; Bruni, IV, 354, classification depending on basic compound: sugar, alcohol, wine, id. 354,

syrup preparation, id., IV, 354

**human alimentation**, beer consumption, damages to health & economy, utility to substitute it with cider's, Evelyn, II, 59

**human alimentation**, N content as biologic measure of food value, De Gasparin, IV, 159, 214-17

**human alimentation**, the 20th century nutrition revolution: meat, dairy products, eggs in popular diets on the six continents, VII, 295

**hydraulic engineering**, instruments to measure a surface's slope, Al 'Awwâm, I, 174-75; Spolverini, II, 139

**hydraulic engineering**, irrigation, levelling-off of a plain surface, Al 'Awwâm, I, 174, choice of channels slope, id., 175, single fields geometric shape, id., 176; irrigation, identification of water-table, tests, id., 172-73, procedures for digging a well, id., 172-73; the mechanics of the noria, id., 173, water classification depending on properties, Al 'Awwâm, I, 172, expedients for utilizing brackish water, id., 172

**hydraulic engineering**, irrigation, practical proceeding, how to divide a field in squares to be successively irrigated, how to check the water flow in bringing in and bringing out ditches, Gallo, I, 288-89

**hydraulic engineering**, rural aqueducts, building technique, De Serres, I, 424

**hydraulic engineering**, necessity of spring's check of rain drainage network, Alamanni, I, 234; Davanzati, I, 365; Landeschi, II, 219-21

**hydraulic engineering**, irrigation, 12th- 16th centuries Lombardy, condition for the rotation intensiveness, I, 285, 288; II, 139; the premises in the Italian communes statutes, I, 214; the Cistercians' role, Berra, III, 303; Bertagnolli, VI, 208-09: the weight of investment, imperative to enhance the produce, Gallo, I, 288; the typical Lombard creation, the *marcita* (water-meadow), shaping a field into a convex-surface with water-giving ditch running on top, Amoretti, III, 66-67, expedients to reduce the volume of earth shifting, id., 67; Zanelli, V, 220; irriguous meadows, Lucca, Cuppari, IV, 375-76

**hydraulic engineering**, embankment shaping, Landeschi, II, 220, achieving terraces on double slope hillsides, id., 221, half-plain surfaces, necessity drainage ditches, id., 221, eroded clayey hills (*calanchi*), shaping terraces with level-ditches (*pescaioli*) to decant silt, id., 221; the herring-bone fields (*campi a spina*) of Testaferrata, IV, 323, applicability to every hillside with minimum earth displacing, Ridolfi, id., 265, slopes reshaping driving the water energy, id., 323

**hydraulic engineering**, underground drainage, Young, III, 14-15; Thaer, III, 204-05; Cherasco, IV, 340-41; Monselise, V, 218-19; in fields with high water table underground drainage allows deeper & faster rooting, for the benefit of crop growth, Russell, VII, 228

**hydraulic engineering**, irrigation, yeld guarantee against rain unevenness, Thaer, III, 205

**hydraulic engineering**, land reclamation, a project's formulation presupposes geological identification of stagnation causes, Thaer, III, 204-05

**hydraulic engineering**, land reclamation, 19 cent. dawn, steam engins first employ mention, Thaer, III, 205-06

**hydraulic engineering**, large river embanking consequences, De Gasparin, IV, 190-91

**hydraulic engineering**, terraces with internal or external wall, terraces alternate with parallel balks, circular little walls around a single tree, Caruso, V, 230-231

hydraulic engineering, dam building for driving water from a river to a channel, Carpené, V, 258

**hydraulic engineering**, use of drop-hammer for drilling, the new american Norton pipes, Carpené, V, 258

**hydraulic engineering**, irrigation, 1978 Israel, general adoption of microirrigation for water scarcity, military & religious reasons, VII, 287, 293, system evolution from hydrodynamic to electronic devices, id., 294; improvement from water-meter-valves responding to farmer needs, Berger, id., 294, system applied to antiparasite treatemens,

id., 294

**hydraulic engineering**, 1978 Israel, low water availability makes it impossible to keep high suction in the whole layer of root activity, so imposing to concentrate water in a soil "bulb", Ravitz, VII, 287-288, foundation: to allow continuity of transpiration with the minimum water volume, Broidi & Bielgorai, VII, 287-290

**land appraisal & surveying**, Roman origins, the gromatic *schola*, Dilke, II, 232; history of methodology, Niccoli, VI, 232

**land appraisal & surveying**, estate appreciation in the history of agrarian science, II, 231; new formulation to meet 18th cent. economy needs, id., 232-33; the forerunners, id. 233; research of basic postulates in natural right, Lucini, II, 238-39; discipline's development, Niccoli, VI, 232

**land appraisal & surveying**, 1755 the deep-rooted habit of calculating value by rent capitalization, II, 234; the method inconsistency, Trinci, II, 234, the need to precisely measure for economically evaluating, id., 235-36, the first enunciation of the "normal value" principle, id., 236; capitalization apology, Nicodemo, Sgherbi, re-proposal, even though incoherent, of Trinci claims, Girri, II, 237; definitive statement of "normal value" principle, Cuppari, IV, 396-97

**land appraisal & surveying**, methods of German authors, refusal of Italian tradition, De Gasparin, IV, 165, land classification on the base of "objective" productive criteria, adoption Italian capitalization procedure changing its name, id., 165

land appraisal & surveying,, necessity inquiry about natural, topographic, mercantile, social factors, Lucini, II, 239-40; De Gasparin, IV, 165

**land appraisal & surveying**, Apulian Tavoliere, lack of fields boundary marks, necessity of land surveyors to ascertain tenants rights, Rosati, III, 136

**mechanical implements**, mill, wind machine superior to the water-mill, Mortimer, II, 70

**mechanical implements**, 19th cent. dawn, age of chimerical iron giants, III, 370; the titan caterpillar for reclaiming Scottish marshes, Heathcoat, IV, 111; the farm served by compressed gases distributors, Pinkus, id., 113; the farm imagined to be ploughed by steam engines moveable on canals, Mc Rae, id, 113; the windmill to operate ploughs, 3 years later, Stollmeyer id, 114, and, 3 years later, Stace e Vallance, id, 114

**mechanical implements**, driller, reasons for substituting manual sowing, Tull, II, 84, inadequate predecessors' tools for the operation envisaged, Cavallina, Terzi, Del Borro, id, 84, functional elements of Tull prototype id, 84-87, key element of "new agriculture", id., 86; doubts about benefits, Thaer, III, 211; advantages, id., 213, seed saving, id., 213; improving Tull prototype, Duhamel, Chateaufieux, Lullin, Arduino, Ratti, id., 360, rejections, De Dombasle, id., 361; Ridolfi, IV, 303; tools for human powering, III, 361; portable models moved by a crank, Brusotti, V, 275; the flimsy machine history from prototypes to industrial models, Niccoli, VI, 237

**mechanical implements**, horse-hoe, foundation of "new agriculture", Tull, II, 81-82, supposed means to multiply plant nourishment also getting rid of weed competition, id., 84, as a complement of the driller use, id., 87

**mechanical implements**, threshers, devices performing the flail's work, Rozier, III, 108-09, the mechanical version of threshing rolls, id., 110; the last endeavour to mechanize the work of a flail, Biernacki, III, 363, the first roll-mills, id., 363

**mechanical implements**, 18th cent. last decades, impetus for machine diffusion from peasant emigration into towns, III, 334, research of new markets for the increasing metallurgic production, id., 335, the empirical creativity successes, III, 334-35; 19th cent., development metallurgic technology kindles evolution of existing machines and creation of new ones, V, 259-60, succession, for every machine, of chimerical creatures, first effective models, progressive improvement to increase their task's achievement, id.,

**mechanical implements**, steam-engine powered thresher, claim of inefficiency, Thaer, III, 211; supposed excess of wheat losses, Ridolfi, IV, 303, 306

**mechanical implements**, 19th cent. dawn, the arising of an intercontinental market, III, 335-36; role of field-competitions & international expositions, id., 336

**mechanical implements**, driller, Garrett replaces claw with a spoon-wheel, Brusotti, V, 275, Smith & Sack models, id, 275

**mechanical implements**, reaper, need of field effectiveness, III, 366; models for frontal cutting by shears, Bell, III, 366-677; cutting by blade & counter-blade, Ongle & Brown, III, 367; lateral cutting, Mac Kormick, III, 367; the first competition between English & American manufactures, Brusotti, V, 227, universal adoption of Ongle & Brown's cutting system, id., 277, models of Burgess & Key (stalks deposited in stripes) & Mc Cormick (stalks collected in sheaves) id., 279, models of Ransomes & Sims, of Samuelson, with semicircular platform placeable vertically & swift rotating horizontally, id., 280; machine's manoeuvre in the field, V, 281

**mechanical implements**, threshing Meikle device with awner and counter-awner, III, 363, complementary devices applied, Biernacki, III, 365; 1870, models for manual driving, Barrett & co's. and Hensman's, Brusotti, V, 285, human energy insufficiency id. 286, horses turning around an axis, the drawback of the propelling shaft rotating at ground level, the Loz' solution, the machine success, id., 286, the versatility of the machine allows for the utilisation of every energy source and the connection of sieving & straw & chaff separation devices, threshers powered by water, diffusion in rice areas of Piedmont & Lombardy, Necchi's models, id., 286

**mechanical implements**, thermic energy utilisation, Watt's steam boiler building before heat laws discovery, IV, 111; first steam boiler applications in Great Britain, id., 368-370

**mechanical implements**, 1850-1900 steam engines rise of power by improved design & construction solidity, IV, 116, plurality utilisations broadens efficiency & versatility, id. 117; steam portable engines, 1880 Ransomes & Sims catalogue: weights, powers, working capacity, Brusotti, V, 261-63

**mechanical implements**, thresher powered by a steam engine, wood container for threshing, sifting & ventilation devices, external driving belt rotating shafts of single devices, Brusotti, V, 287, the main English manufacturers, id., 288, description Marshall, Sons & Co's models, id., 287-88, catalog comprising machine for moveable steam engines of 3-10 hp, with a capacity of 12-36 hl/h, id., 287

**mechanical implements**, mower, derivation from reaping machine with platform exclusion, Brusotti, V, 281, double function models, id., 281, field performance comparison of 5 models in Pavia countryside, machines mow more than 60.000 mq/day against 3.300 manual scyteman, id., 281-82, comparison energy spent by man & by horse, id., 282

**mechanical implements**, hay-windrower, whose Brusotti describes two types, the American one and the horse-drawn rake, V, 283; rakes, double combs & side-delivery rakes, Brusotti, V, 283

**mechanical implements**, steam portable engines, international market, major manufacturers, Brusotti, V, 263, Haining & Tyler, id, 263

**mechanical implements**, 19th cent., analysis of disposable forces, animate & unanimate, the man as a machine, De Gasparin, IV, 174, 220-21; Bruni, IV, 337; horses turning around a vertical axis with engine function, Brusotti, V, 260, paddle wheels, 4 types depending on relation between axis length & water height, id., 260, steam engines, parts & functions, id., 261; inability to cross fields, III, 368

**mechanical implements**, middle 19th cent., De Gasparin's survey of machines and tools, IV, 174

**mechanical implements**, forage cutters, imposed by new zootechny need of balanced diets obtained mixing different feedstuffs, Brusotti, V, 288

**mechanical implements**, scuffling tools, multirow Garrett model with variable



working depth, Brusotti, V, 268-69

**mechanical implements**, 19th cent., information about first device for mechanical milking, B. Pichat, V, 100

**mechanical implements**, 19th cent., Saxton's patent for rope draught devices (1832), IV, 112; 1851, the show at the Christal Palace, challenge among leaders of ploughing apparatuses market, IV, 114,

**mechanical implements**, middle 19th cent., the American challenge to British dominance on international market, III, 367

**mechanical implements**, thresher, endeavours to combine the thresher to the engine, with fire-danger, Brusotti, V, 288

**mechanical implements**, establishment of workshops for new tools at Roville & Meleto, III, 346, at Hofwyl, IV, 3

**mechanical implements**, harrow metal models, iron rigid bars of broken line or jointed segments, both with fixed points, form's multiplicity, Brusotti, V, 270, models by Ransomes & Sims, Howard, Cartwright & Smith, id., 270

**mechanical implements**, rollers, forms & weights, the Crosskill's model, Brusotti, V, 268-70

**mechanical implements**, 1959, Spain, machines import from different countries on which national organisms operate kinematic & dynamic tests, Heredia, VII, 95

**mechanical implements**, 1959, French institutions research purposes, Carillon, VII, 96

**mechanical implements**, plough, mouldboard, lack in Roman implements, White, I, 141; sods twisting obtained by a planck's occasional application, Pliny, id., 140-41; plough with a wheel, Pliny, I, 139-40

**mechanical implements**, *plough*, comparison variety coulter & shares, Pliny, I, 139-41; types for different working procedures, Gallo, id., 318-20; parts & their functions, Heresbach, id., 355; types & working procedures, Mortimer, II, 63, id., 67-69; Amoretti, III, 50; parts and relative roles, Thaer, id., 199

**mechanical implements**, plough, 16th cent. Lombardy, tool with mouldboard & fore-carriage, Gallo, I, 320, "rod-draught", id., I, 320

**mechanical implements**, *plough*, Bolognese & Tuscan arà, peculiarities, Tanara, I, 467-68; III, 349; structure modification proposal, Zappoli, id., 319; irrationality of the work done, Ridolfi, IV, 289-90, diffusion consequence of draught animals shortage & manpower surplus, id., 290

**mechanical implements**, *plough*, 16th cent. Lombardy, reversible models, *voltaorecchio*, Gallo I, 320; Heresbach, id., 355; III, 342;

**mechanical implements**, *plough*, mechanical needs depending on soil peculiarities, Mortimer, II, 67

**mechanical implements**, *plough*, 18th cent. end, from regional types to the models of new constructors, bearing their name, III, 442, 445-46, new designs, implements described by Young, id., 445; the "new ploughs" of Dikson, Small, Bayley, id., 446

**mechanical implements**, *plough*, hypothesis cycloidal movement sod, 1774, Arbuthnot, III., 344; 1799 Jefferson's theorem of the two wedges, 344-45; sods turned over as subsequent parallelepipeds, Thaer, id., 345; Jefferson's theorem version by De Dombasle explained by Molard & L. Thouin., id., 347-48; Lambruschini's confutation, id., 349-50, demonstration of advantages helicoidal mouldboard, id., 350-51, trajectory of the revolution, id., 350, earth movement, id, 351

**mechanical implements**, *plough*, mouldboard, functions & models: Jefferson, Small, Bailey, Thaer, III, 200; disk-mouldboard, precursory models described by Young, III, 342

**mechanical implements**, *plough*, 1812, physics, shape of mouldboard for a complete revolution of sod, Thaer, III, 199; light Mecklenburg models, id, 201, model with little anterior share to cut weeds, id, 201; the "double share" designed for Somerville, Thaer, III, 201, objections to efficiency, id., 201; a later derivation, Brusotti, V, 266, new versions of multishare implements, id., 266,

**mechanical implements**, *plough*, 1836, new models, Molard & L. Thouin review,

III, 352-57, models "à sabot" & only a wheel, id, 352, models with fore-carriage, id., 352, model with 2 symmetrical bodies, De Valcourt model, id., 356; Hugonet & Rosé tools, id., 356

**mechanical implements, plough**, physics, impossibility to avoid lateral thrusts, Molard, L.Thouïn, III, 348

**mechanical implements, plough**, Brabant model, supposedly the most functional in northern Europe, improved by De Dombasle, III, 348, 352-53 Brusotti, V, 265; the Machet's version further modified by Ridolfi, III., 353; pleading for the substitution of the old Tuscan *aratro* by the functional new *coltro*, Ridolfi, IV, 290; awards received, 1855 in Paris, 1861 in Florence, Brusotti, V, 265

**mechanical implements, plough**, evolution, influence of the structure of first steel cultivator, III, 339, substitution traditional parts by new metallic elements, id., 340

**mechanical implements, plough**, English models, curved beam, thin parabolic mouldboard, the 2 wheels of different diameter, Brusotti, V, 266; the first model produced by a manufacturer, Ransome, III, 338; fusion in metal eliminates necessity of sharebeam, id., 339; first models totally metallic, Wilkie, Finlayson, id., 353; a later version of De Valcourt theoretical model, Brusotti, V, 265-67

**mechanical implements, plough**, the fore-carriage a mere burden, Thaer, III, 200; De Dombasle, Molard, L. Thouïn, id., 349

**mechanical implements, plough**, 1836, first American model, Molard, Leclerc T., III, 353-54; after 1870 American tools confirm originality of mouldboard & connection of beam and stilts, Brusotti, V, 266-67

**mechanical implements, plough**, 1770, polishare, precursory models observed by Young, III, 341, 357; Molard, L. Thouïn, id., 356; four-share model by Guillaume, id., 357; multiplicity of models proposed by iron factories after steam-ploughing diffusion, id., 357; the four-share by Godefroy, De Gasparin, IV, 175

**mechanical implements, plough**, helicoidal mouldboard, matrix carving, Lambruschini, III, 349-50; from the matrix to the fusion, id., 350-51; L. Ridolfi, IV, 117-123

**mechanical implements, plough**, 1880, manufacturers in competition on international market, Brusotti, V, 267

**mechanical implements, plough**, the same tool must work at different depths, L. Ridolfi, IV, 127

**mechanical implements, plough**, physics, automatic adjustment of the work variables, Grangé, III, 355

**mechanical implements, plough**, physics, 1845, new Lambruschini's theorem formulation on the base rules industrial mechanics, L. Ridolfi, IV, 118-19, purpose: turn over a clod of established dimension with the minor possible strenght, id., 119, supposing energy required by coulter and share as constant, analysis is reduced to the mouldboard work, id., 119, comparison of energy required by a helicoidal mouldboard with those shaped on different curves, id., 120, demonstration uniformity energy required by a helicoidal tool during sod rotation, id., 120

**mechanical implements, plough**, physics, necessity corispondence of the sod's base to major parallelepiped late, L. Ridolfi, IV, 124, rresearch ideal relation between sod's base & height, id., 124, characteristics of the sod allowing for deformation, essential condition for the work, L. Ridolfi, IV, 119-120, energy needed for clod twisting depends on soil peculiarities and physical conditions, id., 122-23, equivalence energy needed for turning and for crushing sod, id., 124

**mechanical implements, plough**, physics, research mouldboard inclination on the base of inclined plane law, L. Ridolfi, IV, 121-22, analysis mouvement on the inclined plane in infinite points possible curves, id., 121, experimental research friction coefficient for applying inclined plane law entrusted to L. Pacinotti, id, 122, resolution of the sod in indefinable number of parallelepipeds, id., 351; L. Ridolfi, IV, 119, in the earth mouvement 3 operating strenght: parallelepipeds separation from the field, rotation, friction with mouldboard, id., 120, need to revolve the sod 90° plus the angle necessary for the

fall of a semirigid parallelep., id., 125, analysis double rotation parallelepipeds forming the sod, id., 125, the first around the axis of the lower outer edge, the second around the inner hedge, id, 125, for the shaping of a mould for the fusion of the mouldboard, L. Ridolfi substitutes to the cylinder used by Lambruschini a truncated cone whose height equals the length of the desired mouldboard, id. 125; necessity of an appendix of different form, Brusotti, V, 264

**mechanical implements, plough**, Sack double roller model, Brusotti, V, 266

**mechanical implements, plough**, the implement designed by Bella, Brusotti, V, 265

**mechanical implements, plough**, powered by steam-draft cable, elements common to all proposed systems, IV, 115-16, Fowler's primacy amongst competitors, V, 115; from the locomobile to the agrarian locomotive, increases of steam pressure and power, IV, 116; after 1870 adoption of large four-share ploughs, Brusotti, V, 272, review systems of largest success, id., 271-74, Fowler a-system, locomobile with clip drum, anchor-carriage, double four-share plough, id, 272-73, Fowler b-syst., 2 locomotives, id., 373; Howard syst., double windlass locomob., anchors design plough route in the field, id., 273-74; Fischer syst., locomob. windlass moves a thin cable which goes along the field hedges setting in action a plough by reduction gears of the cable-speed, id., 275; all systems efficiency is compromised by frequent break-downs, cable breaking off, producing fatal accidents, id., 274, Hervé Mangon proposal of inserting a telegraph-wire in the cable to allow locomotive & plough operators to communicate, id, 274

**mechanical implements, plough**, tools analogous to plough, ditchers, tools for deep works, III, 342-43; Arbuthnot, III, 355-57; implements replacing the plough, scarifiers, horse-hoes, grubbers, Thaer, III, 201; steam self-propelled digger, first models, III, 343, self-propelled multi-spade, first models, id., 343; 1880, multiplicity industrial models, Brusotti, V, 268, implements designed by Biddell & Coleman, id., 269

**medicine**, peripathetic biology, Galen's four humours theory, I, 196

**medicine**, 19th cent. dawn, the delay in relation to experimental sciences, Liebig, IV, 34-35

**medicine**, infectivity, the concept from T. Tozzetti to Koch, VI, 41

**medicine**, immunity, logical antecedents of Pasteur's researchs, VI, 41, procedure for virulence attenuation of poultry cholera bacterium, id., 46-47

**medicine**, rabies, symptoms, causes, hypotheses, Morgagni, Onorati, III, 148-49; the life challenge, Pasteur, VI, 55, the vaccine's discovery, id., 55-56

**medicine, epidemiology**, 17th. cent., the Italian tradition & primacy, II, 149-50, VI, 38-39, Ainsworth, II, 241-42

**medicine, epidemiology**, of rural population, Sicily, slums conglomeration & cohabitation therein of family & animals favours epidemics spreading (foremost cholera), Sonnino, V, 249; Lombardy, insalubrious homes undermine peasants health., Sacchi, V, 246; the first parliament inquiries, V, 247

**medicine, epidemiology**, of rural population, malaria, diffusion in Naples kingdom coastal marshes, Onorati, III, 176;

**medicine, epidemiology**, of rural population, 19th cent. Po Valley, endemic pellagra and tuberculosis, Sacchi, V, 247; pellagra, suspected cause in maize role as staple food, Amoretti, III, 63-64; doubts about causes, claim of maize moulds harmfulness, Ridolfi, IV, 415-16; disease unknown during sieges, caused by *abnormità vittuaria* [nutritional enormity] of peasant maize diet, Sacchi, V, 246, who studied also malaria and tuberculo-sis, V, 247; opportunistic denial of any correlation by Jacini in *Conclusions* of Parliament Agrarian Inquiry, V, 247

**meteorology & climatology**, rain average & agrarian systems, Palestine, *Deuteronomy*, I, 13

**meteorology & climatology**, signs supplying "true" previsions, Virgil, I, 54-55; Columella, I, 61; endeavour to combine tradition with new physics knowledge, Onorati, III,

139; meteoognosia, the new prevision science which utilizes traditional notions, De Gasparin, IV, 168

**meteorology & climatology**, climate changes, effects on crop yields, Columella, I, 59, 65-66; Huntington, id., 65-66

**meteorology & climatology**, agronomical research, any particular meteorologic circumstance has so a deep effect on yields that only poliannual average data can ensure scientific significance, Gilbert, VI, 111-12, rotation data reliability increases proportionally to the tests periodlength, id, 151

**meteorology & climatology**, courses, effects, Rothamsted 1893, barley, difficulties of attributing yield to specific trends, Gilbert, VI, 95-96, favourable years rise starch & ashes, the contrary unfavourable, id, 99, high yield years increase straw ashes, id., 100, in wheat for every weather trend homogeneous effects, yields resulting the average between max. & min. for every formula, corresponding to middle yield of every plot in the long run, id., 111

**meteorology & climatology**, arid regions with irregular rains, US Plains 4 yr/100 no product., 2/100 max. 2.68 t/ha, average, 0.67- 1.34 t/ha only 29/100 yr, Russell, VII, 227, fallow stores up 2 years precipitations for the benefit one crop only, drastically reducing no-crop years, id., 227

**meteorology & climatology**, the latter being the context of meteorologic events typical of a region, De Gasparin, IV, 168, statistics of recurrence of events with a polyennal frequency, id. 171

**meteorology & climatology**, forests influence on climate, Rosa, V, 225

**meteorology & climatology**, 1957, project for a global climes atlas, Leith, VII, 110

**microbiology**, form multiplicity of vegetable fungine parasytes, T. Tozzetti, II, 253, check using all microscope models present in 1776 Florence, T. Tozzetti, II, 244

**microbiology**, analysis alcohol, lactic & acetic fermentation, the microscope reveals each to be performed by a specific microorg., Pasteur, V, 12, 40 in a culture solution after the colony which developed first, different ones succeeded depending on catabolites left by the first, and others in succession utilizing catabolites of the last one, id 32

**microbiology**, first discoveries performed studying damages to agricultural produce: phytopathies, epizoozies, fermentations & putrefaction, V, 2, middle 19th century organic chemistry advancements & microscope improvement allow new discipline's discoveries, V, 3, the processes' identity (or analogy) explains the multiplicity of Pasteur achievements, id. 6, genially adapting the same methodology, id. 6, VI, 41, Pasteur *memoires* to academies develop theoretical systematization, V,7, for every new research performing the analysis of historical precedents, id. 7, 8

**microbiology**, microorganism spores' ubiquity, Pasteur's air-suction pump, V, 31, the procedure to introduce dust into sterilised flasks, id., 32, succession in flasks of colonies of different species depending on dust composition id., 32, experiments of opening & re-sealing up of flasks containing nutritional solut. at different altitudes, id., 33-34, microbial spores heat-resistence tests, id., 33, spores' swarming proof definitely confutes spontaneous generation doctrine, id., 32

**microbiology**, pathogenesis, need to correlate symptoms to the presence of a specific organism, II, 155, the first intuition by T. Tozzetti studying rust, II, 246; powdery mildew, Marès, IV, 257; pebrine, Pasteur, V, 70, 71-72; confirmation by *flacherie*, id., 79, inoculation ways to transfer pathogens in healthy animals, id., VI, 46-47

**microbiology**, *Saccharomyces cerevisiae*, forms during vital cycle & reproduction, Pasteur, V, 24, supposed change in end products by yeasts getting old, id., 25, tests of yeasts activity in distilled water, id., V, 25, conversion of sugar fraction into cellulose & "albumineous" compounds, id., 25, lacking sugar yeast consume its membrane to survive, id. 25

**microbiology**, beer yeast, *Saccharomyces cerevisiae*, spore production, German chemists demonstration., Pasteur's erroneous denial, V, 24

**natural resources**, the milestones of the relation resources/population: Neolithic Revolution 12.000-5000 b C, VII, 111, modern Agrarian Revolution, 1750-1850, id., 111, the continents conquest of European agriculture, 1850-1950, id., 111, the Green Revolution, 1950-80, id., 111, corresponding to demographic growth after freedom from colonial powers, id., 111

**natural resources**, balance sheet in forager bands, Malthus, III, 376-77, in hunter & fisher groups, id., 378, among migrant herders, id., 378; diet variety & safety gatherer procurement, Cohen, VII, 260; gatherer life uncertainty, Bronson, id., 261; continuous displacement compels gatherers to eliminate unable individuals, maintaining their number under environment potential, Harris, id, 262; review hunting-foraging economies: 1st class seed pickers, who favorise plants with protoagriculture expedients, some becoming farmers others not; 2d cl., groups living from shell-fruit, who do not become farmers probably for the time necessary to grow trees; 3d cl. tuber-bulbs collectors, who become farmers even maintaining primitive life standard; 4th cl. fishermen bands, who do not create agricult.; 5th cl. hunters of social ungulates, who become herders, Harris, VII, 263-64

**natural resources**, potential tame animals, first farmers discover complementarity ruminators with cereal cultivation, whose straw they transform in food for humans, Reed, VII, 241-42; proportion between herds & pasture amplitude in Bronze Age Palestine, Genesis, I, 6; the ratio of conversion of a huge mass of fodder in a animal productsThaer, III, 209, 256-58

**natural resources**, man's environment alteration may compell cultural changes, fire kindled for chase enlarged cereal areas contributing to agriculture birth, Harris, VII, 263

**natural resources**, correlation between agronomic know-how & population density, I, 7; primitive man would have been conscious of the possibility to increase food production modifying cultural practices, Cohen, VII, 260-61; claim of triflingness demographic density explanation for agricultural intensity, Bronson, id., 261; population growth stress factor which would have triggered change from chase-foraging economy to agriculture, Binford, Flannery, Harris, id., 263; grain systematic reaping would have brought Natufian groups to sedentariness, reducing mortality typical of hunter-gatherers, in the 4.000 yr. between wild cereal picking & agriculture (11.000 - 7000 b.p.) Palestine population would have increased from 10.000 abit. to 74.000, Reed, id., 266-67; Natufiani villages population would not have increased because of demographic growth, but attraction of new groups in the area of wild cereal diffusion, Hassan, id., 353; technology/population trends correlation would have been proved by ethnological enquires to be the key element for an understanding of agriculture development, Reed, id., 35

**natural resources**, in Mediterranean coastal regions, Odyssey, I, 18

**natural resources**, warning for conservation, Herrera, I, 221-22; necessity scientific knowledge to make good the damages, Muratori, II, 101, 102; prosperity conservation conditions, Landeschi, II, 222

**natural resources**, 18th century Europe, shattering of mountain/plain equilibrium, free grazing damages, Muratori, II, 101; forest covering condition for plains safety, id., 101; Italy, deforestation vastness, Spolverini, II, 140; Onorati, III, 142; South America, Von Humboldt, Boussingault, IV, 82; Provence, De Gasparin, IV, 231

**natural resources**, every living consociation tends to multiply beyond the disposable food, Malthus, III, 374, growth without limits: New England population, id., 374, the positive checks to popul. growth: famine & diseases, id., 375, man can foresee the hungry suffering and adopt preventive restraints, id., 375, which may be classified in moral or vicious, id., 375, agricultural intensity in 18th century China makes it impossible to imagine there an increase in food production proportionate to natural population increase, id. 379, so all the checks were operating, mostly infanticide & celibacy, id., 382 forecast agricult. improv. & popul growth in Europe, id., 383, availability virgin lands in new continents, moral illicity native elimin., id., 384, Malthus' theorem starts a secular debate, III, 372, the Marxist & the Catholic oppositions, id., 372-386, the Malthus theorem

at the dawn of the Third Millennium, III, 387-88

**natural resources**, population density, comparison Lombardy/England, Verri, II, 290-91

**natural resources**, soil, first support for past & future generations, in 20th century threatened by unchecked phenomena: erosion (see soil), salinisation (see soil), conversion in settlements or industrial areas: between 1962 & 1994 Japan, Taiwan & Korea, all with limited arable areas, withdrew respectively 52, 46 & 42% of cultivated areas, so sealing a perennial food dependence to other continents, Brown, VII, 487; a 1998 Brown's pamphlet foresees that, being comparable China p.c. arable availability, the country should import in the same Japan ratio, id., 487; Lin states that Chinese agriculture would give to cement 190,000 ha/yr, practically the surface given over to airports & new buildings (168,000 ha) between 1987 & 1992; in the U S, a country with immense land resources, primary source for the international market supply, where the land equivalent to New York conurbation is subtract to agriculture every yr, id., 489; in Italy, which in 50 yr lost one half of its agricultural land, many regions, for example Emilia R., fiercely combat rural land usurpation by sloganeering, proclaiming their policy of sustainability, whose nobody never perceived any proof, id., 489-90

**natural resources**, water, role in human economy, De Serres, I, 424; different vegetable spp. demand between 250 & 700 l to produce 1 carbohydrate kg, production of 8 wheat t/ha or 18 maize need 8,000 water m<sup>2</sup> to satisfy physiological needs besides the quantity to allow the soil for the maximum cession and the irrigation method adopted, VII, 491, Postel supposes average necessity of 1,000 m<sup>3</sup> for 1 t of grain production; Rainelli computes that the planet's inhabitant consuming 2,800 kcal/d, needs employment of 1,000 m<sup>3</sup>, composing the balance sheet of planet's availability and uses, Postel computes that planet agriculture employs 2,880 water km<sup>3</sup>, that is 70% of total availability, id. 491, 666; between 1950 & 2000 population growth has contracted average individual disposability from 17,000 m<sup>3</sup> to 7,500, in the world 1,4 billion people do not dispose of sufficient drinkable water, availability show a spread from 425 l/d of U S inhabitants to 10 l/d in Madagascar, id., 491; difficulties to build new reservoirs will rouse a competition between agrarian & civil needs, Conway underlines the increasing cost of 1 ha of irrigated land from new reservoirs, instead 1,270 \$/ha for old dam of Alto Pampanga in Philippines new projects foresee a cost higher than 4,000 \$/ha, besides the increasing cost to displace local peasants in other areas, id., 491; Brown foresees that from 1995 & 2030 China economic growth will increase water demand from 31 to 134 billion m<sup>3</sup> for residential uses, from 52 to 269 for manufactures, from 400 to 665 for agriculture, China employs the army to expel people from land to be submerged, but one must doubt it may preserve for agriculture water today flowing to paddies, id., 492; an exemplar story is Israel's agricult., which in 1950 disposed of 332 million m<sup>3</sup>, in 1970 of 1,340, but then began the contraction reducing availability to 1,162 in 1992 protracted itself successively, id., 492; even exemplar the case of the Mexican state of Guanajuato, which boasts a very productive agriculture, but, being the peasants unable to buy modern irrigation systems, utilise underground strata water, which rains do not restore, so that the entire region is doomed to become a desert, id. 492-93

**natural resources**, hydraulic network, necessity of a public body competent for works & intervention, Muratori, II, 102

**natural resources**, hypothesis of fertility exhaustion as a cause of civilisation collapse, the proof in Greek, Roman and Arabic societies, Liebig, IV, 35-36, VII, 123, urban concentration makes it impossible fertility elements to come back to land, id., IV, 37, depletion England soils for phosphorus removal, id., 37, soils exhaustion would condemn European civilisation to the collapse, id., 37, modern agronomy would try expedients for deferring the inevitable fall, id., 37; Ridolfi, IV, 308; Liebig's thesis supporters: Curtius, Unger, IV, 40; Boussingault, IV, 65; Kautsky, VI, 165-66; Fetter, VII, 123-24; soil depletion in Rome's imperial age: vineyard so esteemed by Columella was the last way for exploiting exhausted earth, criticism against Mommsen, Simkhovitch, id., 124; Liebig's contra-

dictors: Fraas, Conrad, Rodbertus, IV, 41; Hehn, id., 42; rejection pedologic & climatic hypotheses about civilisation fall, Hehn, VI, 2, 27, substitution with racial lucubrations, id., 4, 27, VII, 125; Liebig's hypothesis confutation on the base of Hopkins calculation about supposed composition of "normal soil", Usher, VII, 127-29, claim of plant ability to take necessary elements from deep sterile layer, id., 128

**natural resources**, attribution of Roman empire fall to climate change, as would prove towns provided of aqueducts in regions today desert, Cyrene & Palmyra, evidence climatic change in Classical sources, the phenomenon would have triggered barbaric invasions, Huntington, VII, 124-25

**natural resources**, humankind-soil symbiosis lucubration: first cultivators established a symbiosis with earth fertile layer, seat of microbic life, which soil itself is unable to renew so becoming a duty of man, who neglecting it will condemn to death its symbiont, together condemning himself, Haussmann, VII, 131-33, following on Kautsky's footsteps he claims the necessity of a planet communist government, which entrusted of world's soils responsibility agronomists free of any capitalistic constraint, exorcising capitalistic damages to the planet, id., 132

**natural resources**, supposition of soil exhaustion because civil man evaded the duty to restore fertility, consisting in humus ratio, exploited land & abandoned it, when exhausted after 30-70 generations, Dale, Carter, VII, 134-35, history would present only three exception: the valleys of Nile, Tigris-Euphrates, Indus, id, 134-35, irrigation would subtract cultivated land to its gloomy destiny, id, 135, proofs of the law in Italy & Sicily, supposing imaginary Roman population density, after the decline they magnify Italian population of 16th cent., id., 136; arbitrariness of generations computation, id., 136

**natural resources**, second 20th century's half, an age without precedents in mankind's history, global population increased from 2,5 to 6 billion, cereal production from 630 to 2.000 million t., marine fishing output from 19 to 90 million t., food availability from 2.300 to 2.700 calories p.c., VII, 449; growth factors may be identified in: 1- arables dilatation, from 1.346 to 1,511 million ha; 2- irriguous land enlargement, from 110 to 260 million ha; 3- fertilizer employment increase, from 14 to 146 million t. in terms of nutritional elements; 4- crops defence with insecticides/anticryptogamic treatments; 5- genetics, id., 450-51; yield increase by employing energy in powerful machines: Pimentel shows that in 1977 Mexican *campesino* produced 1.94 maize t/ha consuming 52.762 kcal, while US farmer on the other bank of Rio Grande produced 5.39 maize t/ha spending 8.666.910 kcal., the former obtaining 128,2 kcal for 1 employed, the latter 2,17, id. 452; energy consumption for high yield depends on large use of N produced by Haber-Bosh process: the synthesis of 300 kg N requiring 592 oil l, their dressing 38, with a total emission of 1.914 CO<sub>2</sub> kg; Cavazza calculated that a maize field producing 19.4 dry matter t absorbs from atmosphere 30,8 CO<sub>2</sub> t, which will not remain fixed as would be if absorbed by a forest canopy, energy demand by Haber-Bosh process was reduced, from the origins to the nineties, from 80 to 27 GJ for 1 NH<sub>3</sub> t synthesized, whilst new livestock management do not produce manure proper to be transformed into humus, so that CO<sub>2</sub>/ humus balance sheet of modern animal farming results sistematically negative, id., 453-54

**natural resources**, the questions about possible exhaustion, comparison of trends of resource consumption & pollutant production employing dynamics of systems developed for most advanced computers, Mit's accounts for Club of Rome 1972 & '73, the identification of exponential processes, the metaphor of an alga redoubling every day in a lake: occupied half the area, how many days would pass to complete the invasion? VII, 367-68

**natural resources**, confessions, in particular Catholic and Protestant, & ideologies, had revealed, in the 50 yr. of world agriculture metamorphosis, an absolute indifference for any ethical proposal to preserve resources for future generations, VI, 176; while international conferences on the subject showed complete inadequacy, as that convened in 1987 by World Commission for Environment and Development

**natural resources**, new Millennium Africa shows off all the negative records about

resources use: only 7% irrigated land against 39% southern Asia, shrinkage total cereal production, years '90 wheat -0,81, rice -0,56, with the World's lowest p.c. cereal production: 147 kg/yr, reduction of p.c. livestock produce,; 300 million habitants with daily revenue < 1 \$, VII, 458-59; Deller identifies three keys of African tragedy: reduction from 25 to 5-10 yr. of soil regeneration where the forest-fallow succession was established, erosion of immense arid surfaces, with an average loss of 7 soil t/yr, incontrollable population growth, so to foresee 1 billion increase before 2050, id., 459; that notwithstanding possibility to improve food situation as proved by experience of rice production in Ruwenzori footsteps in rain season, where fertilization plan designed by H. Breman & realized by S. Kavira produced yield increases from 1,5 to 7-8 t/ha, id, 463; Smil calculated that *Leguminosae* contribution to increase N soil content failed, during 20th cent. from 50 to 20%, energy cost to produce N fertilizers suggesting to verify potential tropical *Leguminosae*, abstractly conspicuous, id., 465

**natural resources**, secular competition between food & energy production, fodders & feeding stuffs for draught & war animals, its apparent overcoming at the tractor appearance, re-proposition after dissolution of balance between food & energy prices at the end 20th cent. & organic matter employment to produce energy, VII, 297-98, 457

**natural resources**, forecast of future balance of cereals product./consumpt.: optimistic claim by Alexandrotos editor of Fao report for 1996 World Food Summit, VII, 460, and Rosegrant in the 1999 outlook for Ifpri; in 2000 CIMMYT account Reeves stresses that food availability must redouble within 2030, a task possible only with a unanimous international will; Mc Calla underlines the constant antithesis between economists & geographers-climatologists-argonomists evaluations, the former supposing ample development spaces secured by low last decades prices, the latter measuring natural resources unceasing depletion, id., 460; analysis possible continuity of last decades development factors: naturalists oppose tropical forests continual felling, for water geologists & geographers confute World Bank claim of the possibility to extend existing irrigation surface with 137 million ha of newly served areas, underlining damages to continental environment equilibria produced to rivers & lakes depletion by past sixties-eighties achievements, id., 461; any proposal to increase global fertilizer use kindle opposition because past damages to water bearing strata, id., 462; any increase in antiparasite compound use must be considered with caution, id., 462; among growth factors of sixties-eighty the one with uncompromised potential appears to be genetics, even if previously constant yield increase contracted in the nineties even finding a new momentum in the third millennium, id. 464; in 1950 every planet's citizen was entitled to 0,53 arable ha, in 1996 to only 0,21, a surface which will greatly shrink in 2030, when even the irrigation possibilities will decrease, Gardner, id., 495; Brown evaluates that 1990 China cereal p. c. surface will contract from 0,08 ha, one of the world minor figure, to 0,03 in 2030, with unforeseeable effects for the entire planet, id., 495 guidelines for wheat selection for matching with future planet population, Vavilov, VII, 60-61, necessity cooperation scientist of all involved disciplines, id.,62

**natural resources**, third millennium, Fao computes 1 billion people suffering hunger, but other 300 million to live with a revenue < 1 US \$ per day, & it is incomprehensible how can satisfy minimal nourishing requirements, 3 billions dispose of calories for mere subsistence, it cannot be sure to foresee for 2050 10 billion well nourished people, VII., 454-55; the second 20th centry half marked the end of wheat, maize, rice civilisations: today China is the first wheat producer, but new welfare kindle an unprecedented demand for fodder & feeding cereals to convert in animal products, a phenomenon starting even in India, both countries' authorities claim that they will produce feedstuffs necessary to change nation's diet, but the proclamation is clearly mere sloganeering, id. 456-57; feedstuffs import is more credible, but accurate calculations show that import from the two countries could correspond to total world's exports, compiling India & China import balance sheet one must consider the US sales reduction because of large maize conversion into fluel, id. 457; Malthus had calculated that a population free from food



constraints could redouble every 25 yr, III, 374, in second 20th cent. half global popul redoubled in 50 yr, VII, 495-96, the belief that no constraint hinders future continuous growth is diffused among millions of world's citizens, in the new millennium science is engaged to identify the means to multiply the earth's production, but no scientific certainty guarantees food availability for unpredictable humans billions, to foresee & to manage the changing world should be the duty of politicians, whose main purpose is to humour popular whims, which are generally not only confused but totally irrational, id., 495-96

**natural resources**, officinal vegetables, famines' role in discovering plant properties, Al 'Awwâm, I, 164

**parasitology**, singling out parasite cycle phases & choosing the easiest to strike, *Tinea granella*, Duhamel, II, 174; *Puccinia graminis*, Fontana, II, 260; *Dacus oleae*, Giovene, Giudici, III, 70; *Nosema bombycis*, Pasteur, V, 106-09, *Nosema b.*, Caruso, V, 232-33

**parasitology**, *Dictophyma renale*, first description, Redi, II, 24

**parasitology**, *Distoma hepaticum*, first description, Weston, II, 18; biologic cycle between sheep & molluscs, damages, hygienic precautions, Perroncito, V, 243

**parasitology**, intestinal worms, inefficiency traditional remedies, Redi, II, 23

**parasitology**, parasite worms, anatomy, differences from earth-worms, Redi, II, 25; classification, guests identification, Perroncito, V, 241

**parasitology**, *Taeniae*, classification, biology, guests, precautions, Perroncito, V, 241-42

**parasitology**, nematodes, discovery wheat anguillulae, Needham, confirm. by Gi-nanni, II, 158

**parasitology**, silkworm parasite discovery, *Botrytis*, Bassi, IV, 250-51; *hydropsy*, symptoms, Betti, II, 135; supposed origin in inaccurate breeding practices, remedies, id., 135; the first list of diseases, all of which considered as physiological disorders, Amoretti, III, 77; first cause excessive intensity of breeding practices, B. Pichat, IV, 356, opposition to any microbiological hypotheses, id., 357; pebrine, agent discovery & prophylaxis, first parasitology victory by microscope, V, 5

**parasitology**, *pebrine* pandemic, France, rise of harvest till Revolution, stopping, then new expansion, first infected farms 1849 do not stop expansion until 1853, then the collapse, Pasteur, V, 57-58, buying eggs from other countries spreads infection there. id., 58; bewilderment worm-farmers in infested regions, mountebanks activism, id., 61-62; Italy, 1857, epizooty spreading, necessity to eschew eggs exchanges, Ridolfi, IV, 318-19; 1859, appointment of government commission, 1865 parliament debate, 1868 Pasteur is charged with research in the most interested *départements*, id., 81, the long staying in the Gard, the assistants., V, 55; epizooty's spreading in Lombardy, where Bassi had discovered the *calcino* agent, Pasteur, id., 59, & whose followers, among them De Filippi, Cornalia & Osimo, had performed the first research about pebrine, id., 60-61, while French researchers started their inquiries, De Meneville studying worm's lymphatic cells, id., 59,60, De Quatrefages the "concomitant" pathologies, id., 61, with the knowledge enlargement the comparison of beliefs & suppositions produced the Vittadini method for forecasting the health of future larvae from the presence/absence of parasite cells in the moth's eggs, id., 61

**parasitology**, *pebrine*, description successive phases of *Nosema b.* cycle, Pasteur, V, 65, plurality external symptoms, presence corpuscles in the worm-organs certainty infection, common opinions about importance different symptoms, supposition first cause in mulberry disease, id., 69, ways of infection, objective & seeming symptoms id., 69; capacity microorg. to convey infection, id. 69, pathological anatomy of experimental infection, examination pathogen progresses in the larvae body, id., 70, check of pathogenic potential of wind diffused spores, id., 73, experim. larvae of different cocoon colour infected in different ways & then mixed to ascertain from cocoons colours the power of different infection ways, id., 72, ease of transmission because proximity, rarity for isolated worm-farms, id., 73, research of the parasite forms during the cycle, id., 75, last researchs

in the Gard laboratory, supposition 3 parasite form corresponding to 3 infection phases, id., 75-76; integration Pasteur hypotheses, Verson, 75; erroneous Pasteur supposition of final spores' idleness, id., 79

**parasitology, pebrine**, methods to check eggs sanity, prophylactic procedure by Vitadini, Pasteur, V, 61, winter tests on eggs hatching in Cavaillon (Cevennes), id., 63, Bellotti e Cantoni procedures, id., 65, moth examination & forecast progeny indemnity, in Saint Hippolyte 14 worm-farms, the mayor verifies breeding results & opens Pasteur's sealed report, the scientist's forecasts resulting exact, id., 66

**parasitology, pebrine**, infected moth produces infected eggs, Pasteur, V, 65, healing of a breed at risk of disappearance by keeping in tiny cells male & female moths to verify after coupling egg immunity by microscope examination & foresee eggs soundness, id., 74

**parasitology, pebrine**, precautions for preserving a worm-farm indemnity, Pasteur, V, 67

**parasitology, pebrine**, the recalling of Pasteur's work on pebrine, identification Italian biologists' contribution against epizooty, Verson, V, 250-51; the works about pebrine, Italian contribution, ignorance of those by foreign scientists, Niccoli, VI, 230-31

**parasitology**, silkworms flaccidity (*flacherie*), which Pasteur analyses following his key criterium of the necessary link between specific symptoms and a bacterial genus (or specific bacteria association), V, 79-80

**phytopathology**, first cereals infestation mention, Egypt, *Genesis*, I, 9

**phytopathology**, average crop ratio parasites plunder if not contained: rice 50% (15% cryptogams, 20% animal parasite, 15% weeds), wheat. 35%, maize 38%, VII, 382

**phytopathology**, Galilei's optical disease explication, Ginanni, II, 160, supposed vegetable pathologies similarity to animal diseases, Mitterpacher, III, 46

**phytopathology**, need to discover disease causes, Weston, II, 16, refusal of astrological explication, necessity of microscope investigations, id., II, 16; suppositions on rust causes, Tull, II, 94; similarity wheat pathogens to moulds, Ginanni, II, 159; analogies with Micheli's *Mucoraceae*, T. Tozzetti, II, 245; analogy with Micheli's *Lenticularia*, Fontana, II, 255; rejection fanciful suppositions, identifying in plant diseases a pathogenic microorganisms intrusion in healthy vegetables, L. Thouin, IV, 247-48

**phytopathology**, research of correspondence between phenomena & words, Ginanni, II, 151, inquiry on diseases identity in different centuries & countries, id., 52, wheat diseases in historical sources, id., 153

**phytopathology**, discovery predators of parasite insects, Réaumur, Ginanni, II, 158-59, Duhamel II, 169-70, 18th century science achievement, VI, 150-52

**phytopathology**, enquiry schema based on plots, Ginanni, II, 153-154, meteorological registrations, id., 155, identification phytopathologies as physiological trouble caused, by unfavorable climatic phenomena id., II, 159-160; Mitterpacher, III, 51; Re, III, 295

**phytopathology**, *Puccinia graminis*, succession of predisposing climate events, T. Tozzetti, II, 242-43, Fontana, II, 259; microscopic observation, dendromorphic hypotheses, T. Tozzetti, II, 244; Fontana, II, 259; review curative means proposed in the past, T. Tozzetti, II, 249; nature of spores movement in water, Fontana, II, 254-55, hypothesis of infection because of lymph alteration, id., 259; discovery of the cycle between wheat & Berberis, De Bary, IV, 250, VI, 149

**phytopathology**, *Puccinia graminis*, teliosors & teliospores description, T. Tozzetti, II, 244; morphology of the corpicciuoli [microscopic bodies] parts, Fontana, II, 253; teliosors, uredinia & urediniospores description, id., 254, id., 254-57

**phytopathology**, wheat bunt, *Tilletia caries*, Tillet's discovery of spores infectiousness, II, 157; infection ways hypothesis, T. Tozzetti, II, 243-246, review of suggested remedies, id., II, 249

**phytopathology**, parasite settling through stomata, T. Tozzetti, II, 247; contradictory opinion of L. Thouin, IV, 247

**phytopathology**, discovery infective spores power, Tillet, II, 157; rapidity spores formation cause phytopathies fast spreading, T. Tozzetti, II, 246; major susceptibility leave's lower surface, id., II, 247; spore power, Parmentier, III, 99; Marès, IV, 252

**phytopathology**, discovery by Prévost of *Ustilago tritici* agent, Tessier's opposition to report publication, IV, 248

**phytopathology**, 18th cent., the long delay in comprehension of vegetable pathogens discovery, II, 242

**phytopathology**, disease classification depending from arising times, Parmentier, III, 98, distinction between accidents & diseases, id., 98, wheat diseases produced by "rickets" or "monstrousness", id., 99; continuity same lucubrations from Tessier, Re, Boissier de Sauvage, Berti Pichat, whom Leclerc Thouin includes in a absurd cocktail with true founders of the new science, IV, 248-49; fanciful causes imagined for potato blight in Ireland, Joigneaux, IV, 251; diseases as pure lexical creatures, Re, III, 294-97; Berkeley translation into English Italian's lucubrations before taking sides with parasitic hypothesis, IV 253; B. Pichat's catalogue of lexical larvae, V, 91-94; rejection of microbial agents discovery, Thaer, III, 211; Re, III, 396, distinction of true scientists by 20th century phytopathology historians, Baldacci & Ainsworth, IV, 248

**phytopathology**, Ireland, potato blight infestation 1843, cause's groundless suppositions, Joigneaux, IV, 251

**phytopathology**, protagonists after 1850: Kühn, Berkeley, Sorauer, Tulasne, IV, 251; 1870, knowledge updating, Mouillefort, V, 215

**phytopathology**, genetical parasite polymorphism hinders defence means research, Planchon, Grassi, VI, 140

**phytopathology**, means to protect maize-seeds from soil pathogens, Ubrizsy, VII, 104-105

**phytopathology**, 1959, need of inquiries on viroses, still insufficiently known, Bustarret, VII, 77

**phytopathology**, resistance genes research in spp. akin to crops, Vavilov, VII, 44-45, plurality defence means, hypothesis acquired immunity, id, 44, parasite specialisation imposes that of defence tools, id., 45-46, necrosis cells adjacent to those invaded, Allen, id., 45, first rust strains classification, Eriksson, id., 45

**phytopathology**, sunflower, resistance to moth due to special seed epidermis layer, which larva is unable to pierce, Sakharov, Vavilov, VII, 46-47

**phytopathology**, ergot, *Claviceps purpurea*, description, the pathogenous effects seriousness, T. Tozzetti, II, 252

**phytopathology**, powdery mildew, *Oidium Tuckeri*, infection & diffusion ways, Berkeley, Marès, IV, 253-4; sulphur efficacy discovery, Tucker, Marès, IV, 257-58; Ridolfi, IV, 310; the first new of its presence in Italy, A. T. Tozzetti, IV, 258; experiences of affected vines grafting with American strains, Ridolfi, IV, 311

**phytopathology**, vine mildew, *Plasmopara viticola*, vital cycle, favourable condition for infection, Berlese, VI, 144-47; discovery Cu sulphate biocide power, experimental tests "Bordeaux Mixture" efficacy, Millardet, VI, 147-48; curative utilization, Berlese, VI, 148-49; inquiry of condition for the best effectiveness, Yossifovitch, VII, 68-69, id., 105

**phytopathology**, black rust, *Puccinia graminis*, selection in Minnesota of a resistant wheat, classification of rust strains, Allen, VII, 45; the strategy of poligenetic resistance adopted by CIMMYT, id., 355-56

**phytopathology**, broad bean rust, *Uromyces fabae*, first description, T. Tozzetti, II, 245-46

**phytopathology**, maize smut, *Ustilago maydis*, Duhamel & Bonnet's observations, T. Tozzetti identification, II, 250

**phytopathology**, loose smut, *Ustilago tritici*, infection conditions, difference from rust, T. Tozzetti, II, 251

**phytopharmacology**, seed disinfection by lye, Duhamel, II, 172-73; Ronconi, II, 225; T. Tozzetti, II, 250

**phytopharmacology**, 19th century, use of tobacco solution against aphids, procedure, Roda, IV, 344

**phytopharmacology**, the sulphur efficacy against oidium proved by Kyle with microscope tests, Marès, IV, 252, 257; the range of compounds tested against phylloxera, Cossa, VI, 141; the first anti-cryptogamic compound, copper sulphate, whose power was discovered by Millardet, VI, 147; increasing number of synthetic insecticides, success & limits, Carson, VI, 152, VII, 74, 367; harmlessness primitive anti-cryptogams & insecticide compounds, in first 20th cent. chemical industry offers first molecules harmful for superior creatures, VII, 365, danger magnitude rises in yrs. 50' kindled by the challenge for ever greater yields, id., 366, diffusion organochlorines marks an immense market expansion, id., 366; a sketch antiparasite compounds history, the forerunners, Yossifovitch, VII, 68-71

**phytopharmacology**, 1915 German industry produces organomercury compounds, 1934 synthesis dithiocarbamates, Yossifovitch, VII, 69, years '40-'50 diffusion new carbamates, *Zineb*, *Ziram*, *Maneb*, id., 90; 1939 first organochlorines, DDT, *Aldrin*, *Dieldrin*, *Endrin*, then phosphoric esters, *Parathion*, *Rogor*, Russo, VII, 72-73, future research engagement for creation of systemic molecules, which would kill the parasite when it sucking limph, id., 73

**phytopharmacology**, 1959, Spain, hindrances to substitute in vineyards Bordeaux Mixture with cupric new compounds & first carbamates, because of inveterate peasants habits, then diffusion of *Captano*, Benlloch, VII, 104; persistence use arseniates & nicotine, first diffusion organochlorines, limits imposed to phosphoric esters, Cañizo, VII, 106; Italy, experiences with dithiocarbamates & phthalimides, diffusion *Zineb* in vineyards & orchards, Sibia, VII, 105; positive tests with *Lindane* against last locusts swarms in Puglia, "mineral oils" white & yellow against cochineals & aphid eggs, Russo, VII, 107

**phytopharmacology**, antibiotics, experimental prospects as anti-parasite remedies, Yossifovitch, VII, 71

**phytopharmacology**, 1959, weedkillers, first tests with 2,4 D in Hungary, Ubrizsy, VII, 104-05

**phytopharmacology**, 1959, differences in national rules, necessity coordination in European Community, Braun, VII, 105

**phytopharmacology**, Green Revolution diffused around tropics plants conceived to luxuriate, in a hot & moist paddy environment luxuriance multiplied parasite's virulence, farmers reacted doubling treatments, chiefly by organochlorines, VII, 370; 1997 Conway analysed the defeat of the fight based upon chemicals, proposing in his *The Doubly Green Revolution* the "integrated pest management", id., 370, introduction, thanks to irrigation, of a second crop in Philippines caused multiplication of phytophagous generations, id. 371, analysis of results of Indonesia subvention on insecticide price, chiefly against the rise of *Nilaparvata l.*, id. 372, 1986 government is compelled to ban many compounds, id., 372, invasion of unknown phytophages in cocoa plantation established after felling of virgin forest in Sabah, treatment multiplication till interdiction for favouring natural predators, id., 371, agronomical operations aim to restore equilibrium that cultivations enjoyed into rotation schemes, lost after monoculture triumph, id., 372 plans to favour predators must shorten temporal hiatus between parasite hatching & their enemies', which normally develop when the former offer a sure pabulum, but then damage treshold is surpassed, hiatus may be reduced by artificial rearing of entomofagous insects, id., 373

**phytopharmacology**, integrated pest management: the strategy is based on definition of damage treshold under which intervention is excluded not to hit parasite predators, id., 373, resort to 3 complementary interventions: agronomical procedures, practices which favour natural enemies, genetic measures (introduction of resistance genes), id., 372

**phytopharmacology**, spreading of collective fear of "pesticides": real dangers & insubstantial terror, VII, 366, 1951, Grandi's warning, 1962, Carson volume, 1972, chemistry imputation by Commoner, id., 367, incongruity between fruit & vegetable consumption

becoming a popular & cheap habit & pretension to ostracize phytomedicine, industry's engagement for producing selective & biodegradable molecules, id., 369

**phytopharmacology**, utilisation as insecticide of bacteria & fungi: success obtained against locusts, after great swarms 1986-89, which imposed to spray 1,5 million l. insectic., Lomer identified *Metarhizium flavoviride*, a fungus which showed its power favoured by cannibalism, killing individuals eating dead insects full of spores, VII, 372

**phytopharmacology**, weedkillers, compounds diffused after 2000 interfere with photosynthesis, lipids, amino acid & carotenoid synthesis, general, manifold or specific spectrum of action, VII, 379, turning point in weedkiller history was the transfer from bacteria of gene which produces an enzyme which decomposes glyphosate, a total spectrum compound which dissolves even in the soil, able to hinder in all the vegetables aromatic amino acid synthesis, without interfering in similar processes in animals, spread before sowing crops, id., 374-381

**phytopharmacology**, goals synthesis of biocide molecules: first anti-parasites adopted only after verifying killing power, new ones designed to interfere with a specific physiological function of a precise creature class, VII, 377, neonicotinoids obstruct cell membrane channels for Na absorption, producing insect paralysis, same effect on ionic membranes by molecules which interfere with receptors  $\gamma$  aminobutyric acid; molecules able to fix to neural channels discovered among *Streptomyces avermitilis*'s catabolites, causing paralysis in specific insects, similar molecules identified among other streptococci metabolites, analogous specific effect benzoyl-phenyl-ureae, which affects chitin composition hindering regular shedding with the larva death, similar effects obtained by molecules which fix to receptors of ecdysteroid hormone, hindering shedding regularity, Maggiore, Salamini, id., 377-79

**practical agriculture, seasonal works**, season & country tasks, Hesiod, I, 23; Varro, id, 41; Columella, id., 61; Palladius, id. 145, Al 'Awwâm, I, 165; Crescenzi, a moon-dependent work calendar, id, 201; Gallo, id., 276; Clemente, id, 361; Davanzati, id, 369; La Quintiye, II, 37; Trinci, II, 217; Lastri, III, 392, IV, 383; Cuppari, IV, 383-84

**practical agriculture, seasonal works**, Palladius, I, 146-47

**practical agriculture, seasonal works**, Alamanni, Spring, I, 234-235, Summer, id. 236-38, Autumn, id., 239-240, Winter, id., 242

**practical agriculture, seasonal works**, Tusser, Spring, I, 260, Summer, id., 261-62, Autumn, id., 262-63, Winter, id., 264

**practical agriculture, seasonal works**, Davanzati, September, I, 369

**practical agriculture, seasonal works**, Cuppari, November, IV., 383-84

**practical agriculture**, seed individual selection at threshing, Columella, I, 80; Herrera, id., 220-21; De Serres, id. 383; tests to verify germinability, Al 'Awwâm, id., 162; renewal supplying from different regions, De Serres, id., 383 rejection of sowing superstitious practices, id, 433

**practical agriculture**, against frost the suggested use of smoke, Tarello, I, 341

**practical agriculture**, animal draught, species employed depending on local conditions & traditions, Gallo, I, 316; benefits of cattle utilisation, id., 316, need of strength identity in an oxen couple, id., 318, drawbacks of yoke multiplication, id., 321-22; utility to multiply yoke number, De Serres, id., 382; horses advantages, Heresbach, I, 355; economic comparison, Thaer, III, 189; horse as supposed condition for a "new agriculture", Slicher van Bath, I, 315;

**practical agriculture**, threshing, choosing between flail use or animal treading, Alamanni, I, 237; autumn or winter performance, Tusser, I, 263

**practical agriculture**, hedges, planting practices, Alamanni, I, 243; Mortimer, II, 63; Young, III, 15-16, advantages for rational grazing, Thaer, III, 204

**practical agriculture**, utility to exploit ancient craftsmanship, the forest's trades, Duhamel, II, 197, id, 209-10; rational foundation of cellarmen's practices predicated upon analogies between wine & vineyard life, Pasteur, V, 43

**rural architecture**, swine pens, Odyssey, I, 21; Columella, id., 120; De Serres, id., 402, Thaer, III, 221

**rural architecture**, necessity to proportion buildings to farm dimensions, Columella, I, 60; Heresbach (Pliny), I, 351; De Serres, I, 379; damages by reducing farm surface making buildings redundant, De Gasparin, IV, 172

**rural architecture**, henhouse layout, Columella, I, 121; Estienne, id., 250; De Serres, id., 403-04, Carpené, V, 257

**rural architecture**, olive mill, layout and arrangement, Cato, I, 37, Columella, id., 103

**rural architecture**, villa, tripartition buildings & courtyards, Alamanni, I, 242; Heresbach, I, 351-53; layout of the oven, cellars, larders, Heresbach, id., 352-53; transcription of traditional concepts of classic writers, Niccoli, VI, 232

**rural architecture**, stable's functional requisites, Gallo, I, 328-29; Onorati, III, 147

**rural architecture**, shapes & materials of dove-cot in different regions, De Serres, I, 406-07

**rural architecture**, dairy layout & tools equipment, A. Cattaneo, IV, 349; Besana, V, 302

**rural architecture**, wine cellar layout, Bruni, IV, 345

**rural architecture**, parks, 16th cent. Italy, II, 34; 16th cent. France, I, 418; 17th cent. France, II, 34; 17th cent. England, II, 35; simplest's garden, orientation & lay-out, De Serres, I, 414, 418-19; park history, Ernouf, Roda, V, 222

**rural architecture**, a compromise between modern production needs & traditional harmony of villa's design, Carpené, V, 256, rigid separation owner's home from production facilities, id. 255, tripartition of the whole as prescribed by Renaissance architects, G. Carpené, id. 256

**rural architecture**, option to economize choosing for buildings materials of rapid obsolescence, G. Carpené, V, 256

rural architecture, hygiene & healthiness for the first time proclaimed as a need for peasants' homes, G. Carpené, V, 257

**rural architecture**, standard unities for every animal or operator needs, De Gasparin, IV, 173; G. Carpené, V, 255

**rural architecture**, granaries & silos, G. Carpené, V, 258 rural architecture, new plant design for the mechanized management of great animal number, VII, 296

**rural cooperation**, tasks, first organisms, Niccoli, VI, 240

**rural life**, habits, simplicity & pleasures, Gallo, I, 276-77; Falcone, id., 363; taking pleasure for the rural rough coarseness, Baruffaldi, II, 124; habits and activity, De Gasparin, IV, 184; Bruni, id., 361-62

**rural life**, hailstone horror, superstition remedies, Palladius, I, 147; prevention by annual benediction, Gallo, I, 284

**rural life**, locusts, the superstition remedies, *Geoponica*, I, 152; last invasions in Italy, Russo, VII, 107

**rural life**, hunting, falconry, young predators care & feeding, Crescenzi, I, 209; Hehn, VI, 34

**rural life**, fishing in fresh waters, Clemente, I, 361

**rural life**, magic, formulary, Al 'Awwâm, I, 164

**rural life**, magic, imaginary wolf's organs pharmacological properties, Estienne, I, 256

**rural life**, magic, historical relationship between natural magic & experimental science, I, 212-13; II, 51

**rural life**, urgency to rise peasant dignity, Muratori, II, 100; peasant misery affects global produce, need to rescue peasant from usury subjection, Landeschi, II, 219

**soil science**, soil definition: amalgam of different nature components connected in aggregates, whose stability defines structure, Russell, VII, 142-43

**soil science**, soil knowledge foundation of agrarian practices, Columella, I, 69; knowing soils precondition of farming, Al 'Awwâm, I, 160-61; gardening improves earth, Weston, II, 14; soil productivity depends on people diligence, Muratori, II, 100; soil knowledge & fertility conservation, Davy, III, 279; the imperative of soil knowledge & fertility preservation, Dokučaeu, VI, 73-74

**soil science**, nature as defined by 17th cent. physics, Evelyn, II, 51-52, means to "cure" sterility, id., 54; peripatetic reminiscences in fertility definition based on "complexity", Boussingault, IV, 58, the supposed fancied character of "virgin land" of the layer subjacent the ploughed one, Ottavi, V, 155, which Solieri sensibly proclaims sterile, id., 161; the rethoric definition of B. Pichat, id, 88-89

**soil science**, ideal earth characteristics, Al 'Awwâm, I, 171; the correlation between humus content & N ratio, Boussingault, IV, 62; concept of soil able to ensure water & chemical nutrients overcame by composition balanced solutions giving the exact quantity of water & chemical elements required for maximum yield, Ravitz, VII, 288-89

**soil science**, 1870, multiplicity contributions by number of different disciplines, De Gasparin, IV, 164, VI, 64

**soil science**, 1959, new research goals, clays properties, water movements, microbiology, Bustarret, VII, 76-7

**soil components, clay**, genesis, origin from rocks which lose compounds maintaining the original framework, or by ions in solution coagulation, as Al or silicic acidic hydroxides which bind in new lattices, Russell, VII, 144; clay structure, the thinnest element of soil particles, a product of reshaping of original minerals, resistance to alteration, ability to clothe with a water mantle, Russell, VII, 143, built by superimposed molecule sheets between which exist tetrahedral or octahedral cavities allowing substitution of cations keeping electric charges, id., 144, depending on sheet conformation the first to be classified were kaolinite, micaceous and montmorillonitic, id., 144, clay charges are the key of soil ability to fix and release cations, id., 144, as the sheets do not superimpose perfectly among them there are cavities where organic matter may adhere, id., 145

**soil components, clay**, produced by alternation of sun & rain, properties of clayey soils, Al 'Awwâm, I, 168-69; clay, chalk, peat & coal considered as "elementary earths", Thaer III, 194; clay ratio in the soil & tenacity measure, De Gasparin, IV, 199 supposition of clay power to fix N, id., 241; absorption by soil loams, Ridolfi, IV, 275-77

**soil components, clay**, hydration, in saline solution absorbs ions, no water, but diluting the solution absorbs water between the sheets, increasing the water stratum sheets dilate till the dispersion: clay "deflocculates", with certain ions process is irreversible, the soil becoming a paste, Russell, VII, 150, flocculation is produced by attraction forces between strata enveloping the micellae, which result compressed maintaining the typical form of the latter, deflocculation is a consequence of strata reciprocal repulsion, which separate them definitely, converting clay into a gel, id., 150, organic molecules participate to ionic attraction processes by the free radicals attached to their chains, id., 151

**soil components, clay**, saturation, in agrarian soils clays are saturated by alkaline-earth ions, if saturated by H ions are acid, and may be titulated at an high pH, Al behaves as an ion, under 4,5 clothes itself with a mantle of water molecules, which convert in hydroxils, forming an hydroxide which attributes to the clay the properties of an acid, producing buffering effects under neutrality, Russell, VII, 147

**soil components, circulating solution**, composition determined by Ratio Law, that is the relation between activity of monovalent ions & square root of bivalents, cubic of trivalents, Russell, VII, 145, law validity is conditioned by the individual clays preference for specific ions, id., 146; relative retention energy for every ion is defined for each clay by the Gapon constant, which establishes retention energy of every ion in relation to every other, for low values extraction requires less energy, id., 146

**soil components, free enzymes**, independent from the actual presence living micro-org., their activity is checked after addition a biocycle, Russell, VII, 161

**soil components, humus**, composition, formed by colloids with negative charges, which bind with metallic ions, separation from mineral compounds starts with solution in Na hydroxide, fraction which not dissolves is defined humin, in dissolved fraction a strong acid makes humic acids to precipitate, fulvic acids remaining in solution, addition ethanol to humic ac. produces separation of a new solute from the precipitate, leaving in solid fraction humic molecules of spheric or ellipsoidal shape, with molecular weight till 200.000, containing N, S, P, as well as proteins, polipeptides, nucleic acids, Russell, VII, 166, chemical shapes are not well defined, but they correspond to half the C available, the other half, whose form is destroyed by analysis, is presumed to be formed by polymerized aromatic rings, C/N relation is constant about between 8.5 & 12.8, higher in virgin lands & prairies in cold climates, ploughing induces total C decrease, id., 166-67

**soil components, humus**, exchange capacity, wealth of radicals explains capacity to exchange, measured in milliequivalents/100 g of humus, in fertile soils major than 200, in acidic ones inferior to 70, Russell, VII, 167; the binding with cations have different nature: of neutralisation, polar coordination with water, hydration of ions Fe & Al, chelation, ions are chelated by means of oxydril ions, id., 168, humus joins clays & hydroxides with chains rich of radicals from gums & polyphenols from cell membrane of fungi & bacteria, id., 168

**soil components, humus**, Woburn, formation-dissolution cycle, persistence 25% carbon from manure dressed during 19 years, green manure 14%, Russell, VII, 165, org. matter in soil is converted into humus in the ordinary fractions, progressive stages of decomposition, which is fastened by succession of moistening & drying, is lower in pastures and virgin prairies, enhanced by ploughing, with the tendency to a stable entity, typical for each soil, depending on input and dissolution ratios, in American soil average lifetime calculated 10-45 yrs, in a Rothamsted plot, in a sample from 22 cm layer extracted in 1881 present humus aged 1,400 yrs. between 45 & 67 cm 3,700 yrs, id., 169, Rothamsted Broadbalk field, plot excluded by organic fertiliz. between 1865 & 1966 C lost from 0.105% to 0.099% organic matter, the one manured every yr. increased it from 0.175 to 0.251, both results being obtained in first decades, with a following stabilization, id, 170; org. matter decomposition times, Nicolaisen, VII, 89

**soil components, humus**, effects of buried vegetable residues on fertility, Columella, I, 67; doubts about how improve fertility better than with triennial cycle; Mitterpacher, III, ; vegetable decay, Rozier, III, 94; humus role is dependent from other components of earth, Thaer, III, 195; formation from vegetation residues with an increase of N & O<sub>2</sub> loss, De Saussure, III, 166, sterility of humiferous soils if they do not release soluble elements, id., 167

**soil components, colloids**, saturation trials with phosphates solution of soils of different origin, Kuron, Grüneberg VII, 89

**soil components, sand**, role on earth characters, sandy are the most arid soil, Al 'Aw-wâm, I, 169, the crust after heavy rains is particularly strong in sandy soils, Russell, VII, 192, sand hinders root development, id., 194

**soil components, water**, field capacity, quantity retained by a soil when ceased infiltration & percolation, for every soil it corresponds to a characteristic suction value, for good soils between 50 & 350 mbar, Russell, VII, 185; it is placed between complete saturation and wilting point, at which igroscopic forces prevail on root suction, VII, 288; between the two points Veihmeyer postulates omogeneity absorption forces, Richards claims the need of an increasing effort, id., 288; water moves in the soil for gravity, pressure or suction gradient, speed is max. when all the pores are full, when the major are empty it decreases on the 4th power of the capillaries diameter, mouvement conditioned by pellicles continuity, vapour flux is higher as higher is the gradient, Russell, VII, 185, at the beginning of a rain flux is speedy, then it produces bubbles & clods alteration, which slow it, in good earth the advancing front is distinguishable during many days, advancement is promoted by temperature, id., 185; water covers clods with pellicles, whose behaviour is analysed as a capillarity phenomenon, measuring menisci suction



force, the cause of earth contraction, when it drays, diminishing water content, tension increases reducing free energy, measured as  $pF$ , id., 183, the higher the organic matter range the higher the  $pF$  for the same water content, id., 184, after irrigation water flow ceases, water is stable & suction rises till values of 50-350 mbar, in correspondance  $pF$  characteristic of that soil, winter suction in England 50 mbar, in Africa 350, id, 185, after rain water evaporates from superior layer till a dry stratum formation, losses for diffusion are lesser, soil stores more water from a long rain than from many little successive, wind spurs evaporation, saline soils lose water for osmotic tension, id, 186, curves of relation between humidity (in %) & water tension, different during damping and drying, phenomena producing different series of tensions drawing sigmoid curves separated by a space defined hysteresis, Russell, id,183

**soil chemical components**, nitrogen, cycle, content analysis, De Gasaprin, IV, 191-94; supposition fertile earth to fix N from atmosphere id., 241; Ridolfi, IV, 275; role, Macagno, V, 217; N endowment undergo a succession of four oxidizations converting organic N into ammonia, Russell, VII, 170 ammonia into nitrate, nitrate into nitrite id, 170; in the soil always present ammoniac & nitric N, the former absorbed by clays, is converted into the latter & washed out if not rapidly used by vegetables, analysis finds a higher quantity of N in fallow, probably vegetation inhibit nitrification, in pastures high ammonia degree, but low the nitrates one, for the scarcity of nitrification bacteria, id., 171; land loses N for denitrification, conversion nitrates in nitrous oxide & gaseous N, the phenomenon takes place in fertile soils when aeration becomes scarce, in acidic soils for a chemical process, id., 172, Rothamsted plot abandoned in 1882 to meadow & shrubs, the latter being cleared some years later, showed in 1904 an N increase of 34 and 33 kg/ha/yr respectively in the two section, without any dressing, for rain contribution & micro-organisms fixation, id., 173, difficulties to measure organic N fraction readily convertible in nitrates, but crops show it clearly, tillage produces soil moistening & drying spurring conversion in inorganic forms, fallow produces till 160 kg N/ha, &, if rains do not wash it, wheat absorb it completely, id., 204-05

**soil chemical components**, nitrogen, failure of first pot-test, Home, II, 115-116; its unimportance, Liebig, IV, 25; pre-eminence among fertility factors, Lawes, Gilbert, opposition to the statement, Liebig, IV, 99-110; to increase the soil N reserves in the biennial cultivation, De Gasparin, IV, 301; N essential for wheat carbohydrates synthesis, Gilbert, VI, 142

**soil chemical components**, phosphorus, phosphates are present in soil as mineral ions and in organic forms (for example, inositols, essential for vegetal growth in phosphate-poor soils, phosphates include the series of mono, di, tri, and octacalcium phosphate - as well as the apatites, particularly hydroxy-apatite, which precipitates from the solution very slowly in crystals of uncertain composition due to the different nature of the external layer and the inner part, consisting in calcite crystals, this carbonate layer slows down the rate at which apatite crystals in a solution of calcium, phosphate and carbonate ions reach equilibrium, the reason for the continuously changing relations between the different forms of phosphates, Russell, VII, 197, the solubility of phosphates is strictly correlated with that of iron and aluminium, P in solution in contact with soil is adsorbed following a curve from max. to min., a solution of a lower degree deadsorbs it tracing a different curve, which proves that a part of P has been fixed with stable bounds, id., 199, P in solution corresponds to  $10^{-8}/10^{-4}$  M, a crop may take out 10-20 kg/ha proving that solution is continually renewed, id., 199, many trials were made to establish how much P to dress for creating the availability for the max. production, a purpose infeasible because of differences in soils, climate, cultivation variables, id., 199, particularly poor are terrains of tropics, where intake ability of cultures is generally high, id., 200

**soil chemical components** potassium, yield increase from addition on wheat cultivated in pots, Home, II, 115; for regular intake needed concentration in solution  $5 \times 10^{-5}$  M, exigent spp. require higher concentr., release to soil solution depends on position in

clays, verification of release capacity with pot trials, known soil of exceptional wealth, for exemple in Hawaii, Russell, VII, 140, 203, criteria for measuring availability in short, medium & long time, the latter depending from relatively stable association, id., 203, at Rothamsted plots dressed until 1901, when addition was suspended, after 1957 deliver to sugarbeet was higher than in never dressed plots dressed before seedeng with 125 kg/ha/yr, high intake Gramineae meadows, id., 204

**soil chemical components**, K, Na, Mg, Ca availability, the former produced by sili-cates degradation, K from more stable minerals., Na e Mg are in England borne by rains, Russell, VII, 203, Ca is generally sufficient, in acidic soils compete with Al, Mg may be-came insufficien in limes soils, certain spp. absorb Ce, Ba, Sr, Ra, which store in relation 2:1 in comparison with Ca, K need typical of developed agriculture, some spp. have a low intake ability & hight demand, needing dressing, id, 203

**soil chemical components**, Ca carbonate, discovery of role in fertility, Home, II, 113; Mitterpacher, III, 47; Thaer, id, 195-97, Davy, id, 286

**soil chemical components**, sulphur, present in humus in relation of 1/10 to N, brought by sea aerosol on the coasts, by smokes around industrial areas, necessary for aminoacid synthesis, some spp., like *Leguminosae*, are less demanding, others, like Gramineae, reveal intense need, Russell, VII, 206

**soil chemical components**, ammonium carbonate as product of distillation of a hu-miferous soil, Home II, 114

**soil chemical components**, Na carbonate, dangerous because raises pH & prevents absorption of many ions, Russell, VII 221

**soil chemical components**, gypsum, the use as corrective, Thaer, III, 197

**soil chemical components**, boron in irrigation water at 2 p.p.m. imposes to choose tolerant species, Russell, VII., 222

**soil chemical components**, microelements, effects for grazing animals on pasture revealing minimum lack, necessity direct providing for cattle, Russell, VII, 208-9, some, as Cu & Co, needed in tiny doses, are dangerous if the ratio is exceeded, Se is generally present in phosfate fertilizers, id., 207, Si is present in soil as insoluble quartz, phytolites & silicic acid, Gramineae absorb it to reinforcing cell's membrane against parasites, id., 207, Fe, Cu, Mn, B, Zn, Mo, Co necessary in minimal quantities to plants, animals need even I & Co, generally present in sufficient ratio even if necessity may vary in the same botanic family, from 1 to 100, Fe present in soil solution in minimal quantity, is kept by humic chelates, lack produces chlorosis in fruit-trees, id., 208, Mn present in ionic differ-ent forms, which change as effect of pH & redox potential, frequent lack in the spring, which clear up as temperatures increase id., 209, Cu, Zn & Co pres. in mono or bivalent form, adsorbed by clay or by complexes with humus, id., 209, animals suffer Cu lack in peaty pastures, id., 209, Zn binds with silicic acid, soils poor in Mo do not allow *Legumi-nosae* to fix atmospheric N, VII, 210; Mo binds with Fe hydroxides, from which may be released by liming, Russell, id., 210

**soil chemical components**, microelements, 1950 Spain, lacking on soil vastitude be-cause of secular erosion deforested slopes, evidence effects only where intensive agricul-ture is practised, Del Rivero, VII, 108, effects checked on tomato, vine, apple & pear trees, id., 108; Greece, first tests prove insufficiency seriousness in number regions on citrus & market garden-produce, Démétriadès, Holevas, id., 109; Netherlands, boron lack for sugar beet results widespread in dry summers, narrow in moist years, Henkens, VII, 109; Italy, tests on B lack in fruit-specialised areas, Li, Na e Zn, O. Verona, id., 110, supposed Mo want particulary for *Leguminosae*, id., 110

**soil chemical components**, input & output, balance sheet, the exploitation of New England virgin soils, Liebig, IV, 28-29; balance sheet of mineral & organic compounds, Boussingault, IV, 61-62, the illusion to catch from atmosphere what is extracted from soil, id, 66,, the loss of fodder compounds produced by animal metabolism, id., 67; reintegra-tion of elements subtracted by crops, De Gasparin, IV, 206, rules for the balance calcula-tion, id., 207-08, chemical budget of Grignon estate, id., 209; the absorption of mineral

elements, Rothamsted, Gilbert, VI, 125-26, 129-30, cereals absorb less than forage-crops, but such an entity is completely exported by farm, & must be integrated by fertilizers, id., 131

**soil chemical properties**, exchange capacity, a concept abandoned after the understanding of the role of cation position in the clods, was measured determining the Ca quantity retained washing the sample in buffered solution, it presupposed fertile soil should be neutral, ignoring the Al role, which influences the behavior of all other ions, Russell, id., 148

**soil chemical properties**, pH, property of uncertain meaning, as clays are enveloped by two water strata, Stern & Gouy, adding an electrolyte it compresses Gouy stratum & H ions activity increases lowering pH in Gouy stratum, so approaching the conditions of protons in Gouy stratum to those of the whole solution, Russell, VII, 148, pH varies with meteoric conditions: rain produce cation delivery raising it, roots give out CO<sub>2</sub>, which pull it down helping to forward P absorption, impossible at high pH, id, 149, among fertile soils one recognizes examples from pH 4,5 to 8,5, the former value corresponding to Al hydroxides dissociation point from clays, the latter to Na carbonate presence in soil solution, id, 149

**soil chemical properties**, organic matter decomposition, dead plants are firstly attacked by fungi which consume cell content, then by hemicellulose consumers, finally by those of lignin, at higher temperature bacteria keep part to process, lacking O<sub>2</sub> microorganisms produce methane, burying Italian ryegrass marked with C 14, 2/3 disappear in 6 months, 2nd fraction = 14% in 3 yrs., 6 months, 3rd follows ordinary dissolution time of 25 yrs., Russell, VII, 165

**soil chemical properties**, first researches, Boussingault, IV, 55; dimension of soil particles base of physical properties, De Gasparin, IV, 195, following on the steps of Ott & Schübler, id., 196, his analysis of soil physics defines 12 properties & explains the measuring procedures, specific weight and density, tenacity, cohesion, hygroscopicity, water retention, speed of drying, shrinkage ratio through drying, permeability to oxygen, heat conductivity, aptitude to heat up upon exposure to sunlight, id, 197-99, 201-03, the measure of cohesion, or adhesiveness, is important for assessing energy required for working moist earth, id., 199, need to develop inquiry, id., 204; the list among the premises of Dokučev work, VI, 65

**soil physical properties**, hygroscopicity, capability for water retention, the value higher for organic loam, procedure to measure, De Gasparin, IV, 200, who defines water retention as *fraîcheur*, stating it to be the best proof of fertility, IV, 200

**soil physical properties**, texture is the ratio of composition of sand, silt & clay, measured by granulometrical analysis by flotation, De Gasparin, IV, 163; methods proposed after 1861, Cossa, V, 216; application Stokes equation to classify 4 particle classes, Atterberg, Russell, VII, 142, diagram U S Soil Survey to classify the texture of every soil, id., 143, sand and silt maintain peculiarities of original mineral, id., 143

**soil physical properties**, structure, ground fragment itself into clods of a certain stability, more stable in virgin soils, optimum pores 30-60 micron, with suction 50-100 mbar, glomerule shape is an essential element to classify soils, methods to assess stability, one can stabilize glomerules with Ca carbonate, special humus fractions, in particular polysaccharides, Al hydroxides, Russell, VII, 191-92, addition org. matt. enhance fungi activity, followed by dissolution phases by bacteria, which promote structure, favourable contribution by earth-worms and some crops, like lucerne, conversion into pasture increases glomerules solidity & decreases apparent specific weight, id., 192, grazing destination improves stability, but in rainy days animal hooves damage it, id., 193

**soil physical properties**, temperature, colour role, Al 'Awwâm, I, 168; De Gasparin, IV, 202-03, time for heat absorption, assessing procedure, De Gasparin, id, 203, time heat loss, measuring procedure, id., 202; colour affects temp., a dark one absorbs radiation & speeds up germination, a clear one delays it, in warm regions irrigat. cools earth, crop

coverage shuts out solar radiation directing a part to soil, which gives back a fraction to vegetation, in cool soil roots growth is slow, at middle latitudes crop roots need 20° C, in tropical regions 30°, Russell, VII, 178-79

**soil physical properties**, relation with atmosphere, air composition in the earth varies depending on earth nature & soil moistness, in clayey soils air movement are slow, O<sub>2</sub> permeate a moist soil slowly for the low air solubility, in deep strata one arrives to a point where there is no O<sub>2</sub>, manuring increases CO<sub>2</sub>, but also porousness, & air composition is similar to that in unmanured soil, microorganisms utilize O<sub>2</sub> with efficient cytochrome oxidases, but they are screened by the membranes, which slow intake, Russell, VII, 181-82

**soil physical properties**, O<sub>2</sub> absorption, specific every soil's aptitude, measuring procedure, De Gasparin, IV, 201; soil absorbs O<sub>2</sub>, which roots & microorg. consume, the relation between O<sub>2</sub> absorbed & CO<sub>2</sub> produced is defined "respiratory quotient", a luxuriant culture may absorb, during the growth season, 17,5 O<sub>2</sub> t/ha, rain inflow brings O<sub>2</sub> saturate water, which diffuses from higher concentr. layers to lower's ones, flux is proportional to free porous entity, Russell, VII, 180-81

**soil physical properties**, length solar waves which reach soil 100 μ, refracted between 3 & 100 μ, at Rothamsted energy absorbed 0,15 kjoule cm<sup>2</sup>/day in Dec., 1,76 in June, in July soil temp. can vary 20° C in the day, at 30 cm deepness max reached in July, at 3 m deepness in Sept., annual excursion at 3 m 5,5° C, of the received energy albedo is given back, a part heats soil, one evaporate water, Russell, VII, 178

**soil complex properties**, fitness to agrarian exploitation, 7 US Soil Survey classes of decreasing suitability, depending on 5 obstacles hindering vegetation, due to hydrology, soil morphology, its nature, subjection to erosion, climatology, Russell, VII, 221-22

**soil complex properties**, fertility, La Quintiye, II, 38; Evelyn, II, 52-53; Carradori, III, 150; the only absorption from soil are soluble elements, De Saussure, III, 174, 177; definition of conventional yardsticks to the measure of fertility consumption & addition of every crop, Thaer, III, 192-93; alternative criteria proposed by successors, III, 193; Liebig, IV, 27; relative character in relation to the "exhausted state" at the end of a rotation, Lawes, Gilbert, IV, 97; De Gasparin, IV, 165-66, 206;; ability to exchange cations & anions, Russell, VII, 145, Israel 1978, the giving up of the role of soil fertility and its substitution with the needed amount of fertilizers with water to the single plant, Ravitz, VII, 288

**soil complex properties**, fertility assessment analysing the cenosis of wild vegetation, Al 'Awwâm, I, 169; weeds able to confront specific anomalies, id., 170, vegetable showing soil nature, Liebig, IV, 27

**soil complex properties**, fertility exhaustion by protracted cultivation, Virgil, I, 51, Columella, I, 59, 65, 67; Liebig, IV, 28; restoration fertility elements prevents soil depletion, Columella, I, 88; Liebig, IV, 29-30, need to restore P for all & every vegetable, id., 30; Boussingault, IV, 53-54, 62-63, 65-66; De Gasparin, IV, 206; Gilbert, VI, 133-34

**soil analysis**, empirical tests to assess its qualities, Columella, I, 70, Al 'Awwâm, id., 160; Geoponica, id., 149

**soil chemical analysis**, Home discovers the Ca presence II, 113; the constituents, Thaer distinguish *silica*, *alumina*, *lime* & *magnesia*, III, 194; Davy adds many salts to previous lists, III, 286; Boussingault proclaims P preeminence, IV, 54, analysis procedure, id., 56; De Gasparin, IV, 191, whole soil, procedure, id., 192-93, nitrogen analysis, id., 194-95

**soil genesis**, role of atmospheric agents in rocks breaking up, Al 'Awwâm, I, 168, sterility primary soils, id., 168; first list primary rocks, catalogue elements delivered by disgregation, Davy, III, 286; Boussingault, IV, 28; De Gasparin, id., 164, 189; Davy's intuition foundation 19th cent. pedological research, VI, 58; the climatic genesis theorem, DokučaeV, VI, 72-73; new information about soil genesis, Passerini, VII, 68; soil amalgam of rocks debris & remains dead vegetal & animal creatures, key factor of breaking up

is water temperature & its pH, which operates substituting H ions in silicate network, where at their turn they exchange with Al; in average temperate areas rivers bring 40 salt t/yr for every km<sup>2</sup> of the basin, more abundant ions are Ca & Na, subtraction corresponds to 1 cm deepness every 1.000 years, Russell, VII, 216

**soil chemical evolution**, parallel running of reduction & oxidization processes, Mulder, VI, 76, lack of recognition of microorganisms role in organic matter transformations, id, 76

**soil classification**, number of types & descriptions, Columella, I, 69; Al 'Aw-wâm, I, 169-70; Gallo, I, 316; Weston, II, 15; Evelyn, II, 51-52; Mortimer, II, 66; Home, II, 113-14; Mitterpacher, III, 47; Thaer, III, 245-46; history of classification, De Gasparin, IV, 188, 204, classification depending on origin, id., 190-91, on specific properties, id, 204-06; old & recent classifications, Macagno, V, 216; the new classification criteria founded on pedology, Dokučev, VI, 73

**soil classification**, taxonomy principles, every modern classification is based on stratigraphy, layer 0, fresh organic matter, A, eluvial, B, illuvial, C, poorly involved in living being activity, every country produced its own, the U S's being the most authoritative, all of them apply principles of pedological families, soil series derived by the same geological base in different gradient and climatic conditions, Russell, VII, 217-18

**soil classification**, taxonomy principles, Dokučev and his school proposed a vast taxonomy of European and Asiatic soils, VI, 73; taxonomy of Spain soils, Alarcón, VII, 90; Hungary soils, Szabolcs, VII, 92; in Rumania great variety, chernozem gamut & forst soils, I. Sisesti, VII, 93, Armenia soils, from steppe to forest and alpine soils, Mirimanjan, VII, 93; climatic classification in Yugoslavia compounded with ecological criteria of Italian Azzi, Juras, VII, 94

**soil classification**, *chernozem*, middle 19th cent. Russia, warning for overexploitation & land progressive depletion, VI, 66, origins, hypoteses Russian & German scholars, id., 67; 1876, intervention of Imperial Economic Society, id. 66, 1877, approval Dokučev's bibliographical inquiry & his program of on the terrain research, id. 67, the relation, the manifesto of new soil science, id., 68; Ruprecht's hypothesis, the origin was vegetable matter decomposed & percolated in 10.000 years, replay time meaninglessness, key role of temperature & rocks suitability to vegetation, Dokučev, VI, 68-69, study journeys, stratification analysis, in ordinary chernozem & in transitional soils at the south & at the north of chernozem steppe, id., 70, 1883, doctorate thesis, bibliography critical revision, recognition well founded and badly founded elements in predecessors hypotheses, id., 72-73, formulation climatic genesis theorem keeping into consideration geologic, botanic, climatological, zoologic factors, paying particular attention to rocky matrix diversity, whilst black earth is always identical, the contrary happening at the borders id. 73

**soil classification**, *chernozem*, typical semiarid prairie soil, where rain entity do not allow forest growth, but washes the surface layer, bringing clay & organic matter into earth pores, Ca carbonate forms concretions at 2 m depth, organic layer deep till 1 m, Russell, VII, 219

**soil classification**, *podsol*, illuvial terrain ash-coloured under a surface layer of humus of mor type, the colour being due to the leaching of organic matt. & sesquioxides from A layer to subjacent B., Russell, VII, 218; generally acidic & sterile, properties which may be correctet adding organic matt. & lime, Todorovic, VII, 95

**soi, classification**, tropical terrains, different from all those in temperate regions, oldest in age & formation processes, at higher temp. dissolut. mother rock faster, frequently a porous substrate, basic layer acidic for cations absorption by plants which leave them at the surface, common red colours due to scant hydration of Fe idroxides, Russell, VII, 220

**soil classification**, laterite, typical formation of tropics, superior layer mixed texture soft enough or red clay, subjacent layer 2-10 m red clay speckled by white, at the base white or gray, with typical hollows & pisolitic concretions, Russell, VII, 220

**soil classification**, organic terrains, mor, mull, intermedial types, the former is organic sterile deposit typical under Coniferae, the latter composed by org. matt. mixed with the substrate, full of life, typical of deciduous forests, Russell, VII, 218

**soil classification**, gley, marsh soils assume in anaerobic conditions colours from brown-orange to blueish grey, Russell, VII, 219

**soil classification**, cretaceous earth, Thaer, III, 185-96

**soil classification**, autochton terrains, soils made from subjacent rocks, a particular case, the most common earths having had a "diluvial", "alluvial" origin, or deriving from "silts", "marsh", "dune" or "volcans", De Gasparin, IV, 189, volcanic earths, characteristics, id, IV, 191, chalky earth, characteristics, id, IV, 205-06

**soil classification**, diluvial terrains, supposition of eterogeneous detrituses differential deposition, De Gasparin, IV, 190, alluvial terrains, deposition at a distance inversely proportional to particles weight, id., 190, terrains of marshy origin, traits, id., 191, dune terrains, id., 191

**soil classification**, brown forest earth, peculiarity clay leaching in canalicula created by soil fauna, Russell, VII, 219

**soil classification**, salty terrains, origin in tropics for watertable rising or rainwater evaporation, with progressive salt deposit, they convert into alkaline when Ca is subtracted & Na carbonate prevails, rising pH till 9, which produces clay deflocculation and glomerular structure collapse, Russell, VII, 221, US Soil Salinity Laboratory assesses danger of salinization measuring *ESP*, *Exchange Sodium Percentage*, & *SAR*, *Sodium Adsorption Rate*, claiming the necessity to contain the former figure under exact limits to make the latter to stay in a precise value range, id., 223, plants can not overcome osmotic pressure if suction increases, if it is slow they suffer high osmotic press., id., 222; irrig. waters in Texas & Arizona contain till 2,380 p.p.m. salts, using 5.000 m<sup>3</sup>/ha deposit 2,5 salts t/ha, which impose supplement. erogation to leach arable layer, id., 223, plant sensitivity in first growth stages imposes special expedients, presence Na >15% in exchange context makes irrigation impossible id., 223

**soil classification**, hardpans, large agglomerates cemented by clay percolated from overhanging slopes or created in loco, tipical of tropics, Russell, VII, 220-22

**soil microbiology**, 1866, Gayon & Dupetit's denitrificating bacteria discovery, VI, 88; 1875, Schloesing & Muentz nitrating bacteria discovery, id., 80, 183

**soil microbiology**, 1886, discovery of N fixing bacteria in symbiosis with *Leguminosae*, sowing *Leguminosae* in sterilised soil jar with or without bacterial inoculum, luxuriance & nodules formation in the former, inability plants to grow in the latter, Hellriegel, VI, 78, 105, 180; 1888, specific bacteria identification, Beijerinck, VI, 80; sybiosis peculiarity different spp., mainly *Leguminosae* which originated in tropical washed out soils, in temperate reg. all of *Papilionaceae* operate symbiosis, process requires neutral soils, molibdenum presence, nodules consume 16% cabohidr. produced by plant, in their body O<sub>2</sub> transferred by leg-hemoglobin, Russell, VII, 174

**soil microbiology**, algae & protozoa, among the former *Cyanophiceae*, *Xantophiceae*, *Bacillarioficeae*, *Chloroficeae*, life in very first topsoil cm, 100/200.000 units/g, in particular conditions till 3 million, active only in warm & moist earth, first creatures to settle in virgin terrain, in Asian paddies they fix N, Russell, VII, 154-55

**soil microbiology**, ammonia conversion into nitrite, nitrite into nitrate by two bacteria in competition for O<sub>2</sub>, Winogradsky, VI, 82-83, Nitrosomonans & Nitrobacter, responsible successive reactions, id., VII, 170; other bacteria convert ammonia in nitrite, obtaining energy for CO<sub>2</sub> reduction, fungi accomplish both the reactions., nitrification is hindered by low temp., Russell, id. 170

**soil microbiology**, bacteria number difficult to quantify, using different methods the same soil can reveal from 3,739 million/g to 28,9, the mass may reach 1,5-3,5 t/ha, Russell, VII, 153, Lochhead & Chase's classification, predicated upon nutritional needs, substituted the morphological one, nearly useless because many of them may assume

different forms, id., 153, difficulty to classify actinobacteria, generally aerobic & eterotrophs, id., 153

**soil microbiology**, fungi living in the soil: *Myxomycetes*, *Phycomycetes*, *Ascomycetes*, *Basidiomycetes*, comprising saprophyte & parasite, in ordinary soil are present 1 million spores/g, saprophyte are highly efficient in converting organic matter into protoplasm, acidity tolerant, show different speed in polysaccharids & lignin consump., Russell, VII, 154, fungi send forth mycorrhizae which penetrate into roots with hyphae from which minor hyphae settle in the cells giving rise to organelles in the form of bushes or tufts, mycorrhizae develop with good aeration, organic matter availability, mineral elements' lack, which induces plants to symbiosis, exchanging organic substance in excess with the insufficient N, id. 163; in Sweden forests the cession may reach 0.389 t/ha of ternary compounds converted into umbelliform mushrooms, Romell, VII, 164

**soil microbiology**, N fixation in submerged environment, in paddies fixation is performed by algae & heterotrophic bacteria, which in Asia provide N for a normal yeld, N excessive dressing may activate denitrification, which can be avoided by slow-dissolving fertilizers, Russell, VII, 215

**soil microbiology**, protozoa: rhizopods (mostly amoebae), flagellates, ciliates, dimens. from 2 to 40 micron, feeding on bacteria but stimulating bacterial metabolism, in unfavourable weather conditions they form cysts, Russell, VII, 155

**soil microbiology**, 1895 research of N fixing bact. in different regions' terrain, Winogradsky, VI, 81, discovery fixing ability of *Clostridium*, id., 83-84; 1889 discovery same property in *Azotobacter chroococcum* & *Granulobacter*, Beijerinck, VI, 86, fixing favoured by symbiosis, id., 86; classification in 4 groups: *Azotobacter chroococcum*, *Beijerinckia*, *Clostridium*, *Klebsiella*, *Achromobacter*, the former being the most active, demanding a O<sub>2</sub> moderate concentration, the process seems to be the same for all, requiring Fe, Mo, Co & B, N is bound to  $\alpha$ -chetoglucuric acid, Russell, VII, 173-74

**soil microbiology**, N fixation in symbiosis with *Papilionaceae*, *Rhizobia* are of short-rod form, becoming T or Y shaped when the conditions are unfavourable, many classifications suggested, but relationships between bact. & plants are not constant, they are attracted by roots' exudates, in particular by tryptophan, enter into roots through a filament & settle into membranes produced by roots, where they convert into bacteroids losing some properties, when active they assume a pinky colour, as nodule ages they come back to bacterial state concentrating on cell walls, and after the root's death they spread into the soil, the process is governed by specific plant's genes, the number of free cells varies in different soils, Russell, VII, 175

**soil microbiology**, root-bacteria symbiosis, apical root segment is surrounded by bacteria & fungi, in poor earth competition arises for essential elements, in rich soils exchanges are continuous, in developed segments pathogen saprophytes manifest their properties only if root faces adverse conditions, *Azotobacter* inoculum stimulates a favourable flora for wheat, Russell, VII, 163

**soil microbiology**, soil microorganisms include bacteria, actinobacteria, algae, protozoa, autotroph & eterotroph, not a rigid separation, the latter require compounds they are not able to synthesize, Russell, VII, 152, they all absorb from the soil P, K, Na, Ca, Fe, S, traces of Mn, Zn, Cu, Co, B, id., 152, the O<sub>2</sub> source distinguish aerobic & anaerobic, id., 152, quantity of catabolites is lesser the higher O<sub>2</sub> availability,, id., 152

**soil microbiology**, sulphur bacteria, utilize sulphates as O<sub>2</sub> source., Winogradsky, VI, 80

**soil microbiology**, biocide compounds degradation, microorg. acquire ability to decompose toxic compounds & consume molecules of the same crystallographic conformation, some biocides, as organic chlorides, are slower to be demolished, Russell, VII 161, the catabolites being the key of symbiosis & antagonism among bacterial strains id., 161, many actinomycetes produce antibiotics, but the effect in the soil is exiguous, some fungi in favourable conditions may stop other's proliferation, sterilization interferes on relationship between microorganisms & toxic compounds, id. 162

**soil zoology**, fauna traditionally divided into meso and macro-fauna, the former comprising rotifers, nematodes & arthropodes (which include acarids, collembola & other insects) the latter including earthworms, millepedes, centipedes, chilopoda, insect larvae, ants & termites, Russell, VII, 156-58, macro-fauna accomplish a capital role for the earth stirring id., 156; fertile forest soil may contain till 2.000 earthworms kg/ha, the same weight of cattle on the same surface, Bornebusch, VII, 156, consumed oxygen corresponds to demolished org. matter, difficulty to classify earthworms, whose presence is different in manured & no-manured fields, they phagocite dead org. matter but their metabolism was not yet known, in rainy conditions they transport to the surface till 25 t/ha/yr of earth, Russell, VII, 157.; equally important the division between phytophage & soprophage creatures, id. 156; digging their galleries earthworms, ants & termites perform a capital function mixing & remixing soil particles, id. 157, 158

**soil zoology**, ants, ubiquitous on the continents, termites only in equatorial regions, they build up earth heaps of diameter till 18 m, 7.5 m high., where collect org. matter on which mushrooms, being their food, develop, abandoned termitaries are occupied by different species, *Diplopoda* & *Isopoda* are organic matter consumer, *Miriapoda* are predator, presence *Gasteropoda* & *Rodents*, Russell, VII, 159

**soil zoology**, a variety of saprofagous, phytofagous, coprofagous & predators cooperate in different ways to successive stages of organic matter dissolution, consuming the same chewed food,

**soil zoology**, earth-worms contribution to mix up geologic & organic elements of amalgam, Darwin, VI, 58, study of mixing of correctives spread on the surface with sub-jacent terrain, id., 60, measure submersion in land of ancient monuments, id., 61

**soil ecology**, organic matter decomposition follows a regular succession, most dynamic organisms precede competitors, producing catabolites which favour different creatures, in the multiplicity of microhabitats even the less aggressive find their feed., Russell, VII, 159-60, soil life depends on organic matter produced by autotroph organism, plants & algae, whose energy is dissipated, catabolites are utilised from different creatures in succession, in Broadbalk plots energy consumption evaluated in 16 billion joule/ha/yr, id., 160, bacteria need a water film, for fungi steam is sufficient, temp. is essential, till to a max. which stops microbic activity, following the schema of perfusion experim. of Schloesing & Muentz one can verify successive consumers of originary substance catabolites, id., 160

**soil nature alteration**, erosion, phenomenon seriousness on planet scale, Passerini, VII, 68; diffusion in El Salvador because of slopes cultivation, Klinge, id., 93; entity in Armenia in all the fields on sloping terrain, Mirimanjan, id., 93-94; India, Pereira, id., 447; multiplicity inquiries proves progressive deterioration planet's soil inheritance, Wageningen 1992 report mentions 2 billion ha pasture, forest, arable damaged, on 22% land used to produce food withdrawal of 25-75 billion soil ton, Rainelli, id., 482; from 1950 long dispute among geographers, climatologists, botanist & agronomists about overgrazing role in desert dilatation, a process which excites an old polemic, in 2006 Hein & Ridder demonstrate that after rain African desert do not react with the production of the fast & large mass of new vegetation as, with equal water quantity, in past, id., 483, Gruhn & others underline harmfulness of communal pasture, which induces herders to multiply head number so to appropriate of maximum of vegetation, ignoring the damage to the collective resource, id, 484

**soil nature alteration**, hydraulic erosion, it occurs when rain quantity exceeds infiltration capacity, the higher the water violence, the greater the volume of sediments brought away, among the causes kinetic energy drops, which destroy clods tamping pores, cloddishness protects soil state, an efficient defense consists in dividing land in stripes parallel to contour lines planting in each a different crop, a rotational meadow loses 4,3% of rainy water against 40,3% of maize in monosuccession, rotation has positive effects, soil losses are in proportion to water stream on the surface, 0,05 t/ha in pastur-



land against 246 in continuous maize, Russell, VII, 227

**soil nature alteration**, aeolic erosion, wind lifts particles between 0,02 e 0,07 mm diameter which will fall again after hundreds of km forming a loess, those even inferior will be brought into clouds for thousands km, wind strength may be hindered by crops residues, by modelling soil in balks, by tree barriers, which protect a space corresponding to 20-30 times their height, Russell, VII, 225-27

**soil nature alteration**, salinization, chlorides accumulation because of inadequate irrigation practices, reasons for the Tigris-Euphrates delta sterilization, Thorkild, Adams, VII, 130, id. 487; in Pakistan, relates Ekholm, salinization just caused the loss of two million ha of irrigation systems, id., 487

**soil management**, tillage, purposes, Isidore, I, 155; to prepare the nourishment for the plants, Tull, II, 77; to expose earth to atmospheric agents action, Home, II, 117; adhesion to Tull thesis, Ronconi, II, 224; the seven goals of plough work, Thaer, III, 198; the goal of ploughing to enhance chemical exchange with atmosphere, L. Ridolfi, IV, 124; the essential goals: to break up soil and to cleanse it, De Gasparin, IV, 179;

**soil management**, tillage, claim that earth work may replace fertilization, Tull, II, 79-80

**soil management**, fertilization, supposed fertilizing compounds, comparative tests in jar, Home, II, 114-15; Tillet, III, 95; mixtures of different fertilizers, Ville, V, 155, results: preminence effects of nitrogen, id., 156

**soil management**, amendants, distinction from fertilizers, Pliny, I, 137; inclusion mechanical implements, utilisation, Mortimer, II, 63; De Gasparin, IV, 167; Macagno, V, 217

**soil management**, amendants, marl, properties & utilisation procedures, Pliny, I, 137, varieties, id., 138; Heresbach, id., 354; Home, II, 112; Thaer, varieties, utilisation, III, 197; benefits for soil structure if employed in large quantities, Russell, VII, 192; ashes, utilisation, Thaer, III, 197, gypsum, Thaer, III, 197; Burger, IV, 10; Sprengel, id. 14; against Liebig denial, Boussingault composes a list of opposite theses citing Davy, W. Smith & Villèle, id., 59

**soil management**, amendants, Rothamsted, manure in large quantities in 100 years improved dimensions of soil clumps, Russell, VII, 192

**soil management**, amendants, quicklime, utilisation, Pliny, I, 138; Gallo, id., 286; Heresbach, id., 354; Thaer, III, 195, limestone effects on humus, id., 197; quicklime, limestone, chalk produce benefits on soil struct., Russell, VII, 192, tests in G. Britain prove sufficiency 2.5 t/ha limestone, which may bring pH to 6.5, correcting acidity, id., 211, quicklime, slacked lime or pulverized limestone in excess may immobilize microelements, in the pastures many years are needed to verify the effects, land treated with lime can lose 2.5 Ca kg for 1 mm of rain, that is 300-400 kg ha/yr, id., 212

**soil management**, amendants, use potassium bicarbonate in correction of acid soils, Audidier, VII, 99

**soil management**, fertility regeneration in depleted fields adopting good practices, Columella, I, 66, 67; Duhamel, II, 189; analysis evolution depending on applied practices, Kemenesy, VII, 9

**soil management**, paddy submersion, first effect anaerobiosis, which imposes to bacteric popul. reduction inorg. & organ. compounds, with conversion ferric hydroxide into ferrous-ferric, which precipitates buffering solution with organic acids production, which progressively change into hydrocarbons, among which ethylene, dangerous but bearable by rice, proceeding org. matter consumption redox potential lowers from +400 to -200 mV, solution Mn & Fe ions keeps into solution P, Ca & K, which, if the soil drains, are lost, Russell, VII, 212-13, adding organic subst. process reaches equilibrium in some weeks, in paddy soil one recognizes on top a oxidized film, under which there is a thicker grey layer with ferrous concretions, and below a permanent grey layer whose characteristics are those of a clay soil, id, 214

**soil management**, eolic erosion stoppage, damages prevention a controversial subject, but even more discordant opinions about stopping the phenomenon, experience of U S dust bowl, hurricane series started in 1934 after ploughing and cropping the arid soils of the windy region of Great Plains demonstrates that erosion can be controlled, but the amount of scientific & financial means employed can not be adopted in poor countries, VII, 484; Conway mentions projects for erosion control in Zimbabwe 1929-39 & Malawi 1945-60, abandoned by population which did not comprehend the goals, the same result for 200.000 km of terraces on Aethiopian plateau after 1978 hurricanes, id., 485; positive results in China & other countries where the peasant propensity to plant trees into arable fields was stimulated, id. 486

**soil management**, salinity correction, the most effective procedure is to percolate water which washes away salts, it also helps to grow vegetables which absorb salts & to bring plants away at maturity, in Sudan *Atriplex muelleri* proved to absorb 0,5 t Na/ha/yr., if a irrigation system succeeds in draining soil washing away salts, the drainage water may deposit them in subjacent systems, where salts accumulate, Russell, VII, 224

**soil, land reclamation**, land submerged by sea invasion, which leaves NaCl, may be performed dressing Ca sulphate, which will be converted in Na sulphate, allowing rains to wash away Na, Russell, VII, 224

**soil, land reclamation**, France, Landes project, whose soils are sandy acidic with an humiferous subsoil & ferruginous concretions, combination of deep trenching & lime dressing, results analysis, Delmas, VII, 91

**soil, land reclamation**, Spain, project for large salt lagoon at the Guadalquivir mouth, alkaline clays, need of washing alkalis away, river water inaptitude because tide height, compelling to use rain water, even if scarce, Covián, VII, 90

**soil, land reclamation**, waterlogged areas, imposes slow elimination sulphides, which are converted into sulphates lowering pH & interacting with Ca carbonate, the necessary washing of salts may be very slow, Russell, VII, 215

**textile & dyeing spp.**, cotton, 1860, Manchester manufactures pretend their raw material production be improved in Indian empire, facing government opposition to avoid land subtraction to opium production, Kumar, VII, 440

**textile & dyeing spp.**, cotton, spreading in south Italy during U S civil war, Arduino, III, 321

**textile & dyeing spp.**, flax, place in the rotation, Gallo, I, 298, cultivation practices, id., 299, times for uprooting & retting, id., 299, fiber extraction: braking & *spadolatura* (by a spatula), id., 299

**textile & dyeing spp.**, flax, beginning 19th century, role in Cremona province's rotations, Bellò, III, 304

**textile & dyeing spp.**, hemp, cultivation practices, Gallo, I, 299-300; Tanara, id., 466-471, tillage & fertiliser dressing, id., 467-70; Baruffaldi, II., 124, soil works, benefits of spade use, id., 124; beginning 19th cent., 3 plough works followed by spade *ravagliatura* (furrow deepening), Re, III, 414

**textile & dyeing spp.**, hemp, cultivation, productivity, seeding thickness & stalks height factors for fibre quality, Gallo, I, 299-300

**textile & dyeing spp.**, hemp, procedures for fiber separation from stalk, Gallo, I, 300; Tanara, I, 472; Baruffaldi, II, 125-26; integration scutch work with wood or stone rolls, Amoretti, III, 64

**textile & dyeing spp.**, hemp, retting procedure, Tanara, I, 471-72; Baruffaldi, II, 127; retting effects on fiber quality, Tanara, I, 471-72; Baruffaldi, II, 127-28; substitution retting into water with earth heap, Amoretti, III, 64

**textile & dyeing spp.**, key dyes role for 16th century textile industry, I, 301

**textile & dyeing spp.**, 19th century Two Sicilies kingdom, cotton cultivation in Apulia & Sicily, Onorati, III, 141; 1959, program to employ genetics to create lines more suitable for regions where is traditionally cultivated, Barbieri, VII 81

**textile & dyeing spp.**, woad, madder & sumac, cultivation practices, Gallo, I, 301-02; De Serres, I, 423; madder & woad, Mortimer, II, 63; Ridolfi, IV, 299

**vegetable physiology**, vegetatio phases, dependence from seasons cycle, Lucretius, I, 48; dependence by moon's influence, Crescenzi, I, 201

**vegetable physiology**, 17th century fancy "demonstration" of uniformity of vegetal nutrition & animal digestion, Malpighi, II, 30-31; nutritious principle identified in flimsy "humiferous chyle", the dilemma of identity or difference among "juices" absorbed by different spp., Duhamel, II, 185-86, 89; Rozier, lucubrations, III, 92-94; Quartapelle, III, 133; Duhamel ideas transcribed by Re & plagiarised with a 60 years delay, III, 294, Bruni, V, 337; the last chimera presence in Cantoni's *Enciclopedia*, V, 213-14

**vegetable physiology**, nutrition, role nitric salts, Weston, II, 14; Tull, II, 76; Muratori's intuition, II 101

**vegetable physiology**, growth process would depend on affinity, attraction, assimilation imaginary laws, Rozier, III, 97

**vegetable physiology**, branches lengthening in winter from an hot glasshouse stop their growth, Duhamel, III, 104

**vegetable physiology**, nutrition, process understanding condition for agriculture performance, Tull, II, 75, principle research among Aristotle matter elements, id., 75-76, identific. essential elem. in earth, id., 76, functions of root mouths, id., II, 78; need its perfect subdivision for absorption by roots, id., 77; research among chemical compounds, Home, II, 116, Tull's thesis rejection, id., 116; Mitterpacher, III, 48; supposed phlogiston role, id., 46; assent to the phlogiston belief, Re, III, 396; the doubts about plant's supposed ability to commutate chemical elements, Sprengel, IV, 15;

**vegetable physiology**, nutrition, hypothesis water role, Van Helmont, Boyle, II, 7-8; opposition, Tull, II, 76; first aerial nutrition hypothesis, Hales, II, 116; rejection hypothesis C aerial absorption, Home, II, 116, eclectic earthly-aerial theory, id., 117; account Boyle's experiment, II 7; Percival's discovery CO<sub>2</sub> role, Priestley's confirmation, Quartapelle, III, 132-33; predecessors hypotheses review, Duhamel, II, 187-88; relation between water absorption & transpiration volumes, id., 185, two phenomena still considered independent, whose rational connection will explain the linchpin of vegetable life, the photosynthesis II, 187

**vegetable physiology**, nutrition, role root system structure, Tull, II, 88; Duhamel, II, 189; Rozier, III, 101; Ridolfi, IV, 281

**vegetable physiology**, weeds competition for light & nutrients, test substitut. dead wood volume equivalent to weed mass, obtaining the same result of a scuffled field, Tull, II, 80-81, seed dormiency explains unexpected infestations id. 81, dependence weed-hoeing effects by weather following conditions, id., 81

**vegetable physiology**, vegetable ability to grow on bare rocks, Davy, III, 288

**vegetable physiology**, limph, rise, capillarity hypothesis, Home, II, 117-18; Mitterpacher, III, 43; double circulation hypothesis, Mariotte, II, 190; sap chemical composition, Boussingault, IV, 46

**vegetable physiology**, photosynthesis, process explication by De Saussure, II, 8, foliar CO<sub>2</sub>, absorption, Priestley, Mitterpacher, III, 45; using light energy green leaves assimilate CO<sub>2</sub>, appropriating C & delivering O, De Saussure, III, 159-60, as in normal atmosphere plants live perfectly if it contains CO, id., 168, research of retained C destiny, id., 161, the same ability discovered in green flowers & fruits, id. 165, atmospheric O<sub>2</sub> absorption during the night, id., 161, roots' O<sub>2</sub> need for respiration process, id, 164, water molecules splitting to connect H to absorbed C, id., 169, to integrate aerial gases absorption necessity of soil elements intake, id., 175-77; mineral ions absorption by soil, humus fundamental chemical elements source, humus, insolubility proves impossibility absorption by vegetable, id., 167, max. quantity vegetal soil extract absorbable by water, id., 167; humus combustion & ashes elements analisis, id., 167, after ebullition extract contains mineral nutrients, id., 168, vegetable luxuriance in extract solution, id., 168, ab-

soaked ion list, id., III, 175-76, variable ashes composition, id 178, particular soil solution may induce presence of unnecessary elements in ashes, id., 177; the highest quantity of mineral salts needed by active vegetative organs, id, 178, leaves inability to fix N & H, id., 163, their dangerous effects on roots, id. 164, root selective absorption ability may be fully altered by amputation or toxic compounds, id 176, impossibility vegetables to produce new ions through atomic conversions of elements of any origin, III, 172, as supposed by German chemists, IV 15, vegetation rules are not followed by sprouting seed, which consume their carbohydrates with a perfect respiration process, producing CO<sub>2</sub> seed need to germinate, id., 160

**vegetable physiology**, photosynthesis, appropriation, by Liebig, of predecessors' discoveries, mainly De Saussure, IV, 23, 25, 27; the ignorance of the discovery by Thaer, III 192 & by Davy, III 284-86; Russell comment, III, 156

**vegetable physiology**, nutrition, demonstration of necessary character of chemical absorption from soil, Wiegmann & Polstorff, IV, 12, P priority among fertility elements to be replenished, Liebig, IV, 29-30, the secondary absorbed elements: P, S, Cl, K, Ca, Na, Mg, Si, Fe, id., IV, 26, necessity of S in correlation with N absorption, id., IV, 27, mineral bases' fungibility to neutralise acids, id., IV, 27: Boussingault, IV, 54-56

**vegetable physiology**, nutrition, drawing of mineral elements from soil solution, De Saussure, III, 176-77; Liebig, IV, 27; the intuition of the saline concentration's importance of soil solution, Boussingault, IV, 59; De Gasparin, IV, 191

**vegetable physiology**, nutrition, N absorption in ammonia form, Liebig, IV, 25; Rindolfi, IV, 277; different opinions review, Macagno, V, 217

proportionally lower the cultural cycle, id., 80

**vegetable physiology**, the "Minimum Law", Sprengel, IV, 13; appropriation by Liebig, IV 29; refusal by De Gasparin, IV, 161, application to fertility balance-sheet, id., 208

**vegetable physiology**, photosynthesis, supposition of carbon sources alternative to atmosphere, Sprengel, IV, 12; Davy, III, 289, supposition absorption of C present in suspensions & dispersions, Davy, III, 288, re-proposition traditional believes, id., 289, hypothesis N absorption from air, id., 290,

**vegetable physiology**, nutrition, luxuriance vegetables in humiferous soils, which would provide assimilable organic matter, Home, II, 116; Mitterpacher, III, 46; Quartapelle, III, 133; phenomenon explication, De Saussure, III, 173, 176-77; supposed experimental proof of N absorption from atmosphere, Boussingault, IV, 47

**vegetable physiology**, imaginary reduction, in the process, of CO<sub>2</sub> to CO, Boussingault, IV, 48

**vegetable physiology**, nutrition, preference ions intake depends from local flora peculiarities, Liebig, IV, 27

**vegetable physiology**, every flora has developed in specific weather conditions, Boussingault, IV, 80, total health need of every agrarian species is identical at different latitudes & height above sea: higher the average temperature, shorter the growth cycle id, 80

**vegetable physiology**, sprouts rise in antigravitational direction if subdued to centrifugal force, Boussingault, IV, 46

**vegetable physiology**, long lasting seed vitality, life-transmiss. organ, Boussingault, IV, 45

**vegetable physiology**, utility to study biology of active yeasts, a simplified model of superior vegetable, Mirbel, Pasteur, V, 23

**vegetable physiology**, N priority among growth elements, Lawes, Gilbert, Liebig's opposition, IV, 102-106; De Gasparin's consent with Lawes, IV, 208; supposed ability crops to absorb little N quantities of atmospheric origin, Lawes, Gilbert, IV, 108; 1893, yield plots dressed with different formulae lacking N are equivalent, inferior to those added with N, Gilbert, VI, 114-15

**vegetable physiology**, middle 19th cent. state of knowledge, De Gasparin, IV, 167;

the vain passion to deride the conflict among great school & scholars, B. Pichat, V, 91; Cantoni's *Enciclopedia* claims questions about leaf functions still being unresolved, V, 213; proof of slightness of discoveries after De Saussure, persistence illusions & contradictions, id., 214, future research goals, Cantoni, V, 166;

**vegetable physiology**, 15 elements absorbed by soil, Sprengel, IV, 14; the opposed phenomena of rock delivery and cultivation subtraction of chemical elements, Liebig, IV, 28; a new list of essential fertility elements, Boussingault, IV, 49; analysis procedure to identify soluble elements present in a soil sample, De Gasparin, IV, 191-94

**vegetable physiology**, the fancied advantage of crops absorbing more elements from atmosphere than by soil, Boussingault, IV, 62; Ridolfi hypothesis supporter, IV, 275

**vegetable physiology**, photosynthesis, utilised light waves length research, Cantoni, V, 211 composition of solutions allowing plant growth in water-jars, Knop, Cantoni, V, 214

**vegetable physiology**, Rothamsted 1893, comparison org. matter produced in plots provided for 40 yr. of only chemical fertilization with product. in plots dressed only with N proves org. matter synthesis depends from N availability, Gilbert, VI, 109, supposit. N necessity for chlorophyll composition, id., 109, experiment confirm De Saussure axiom of lack of any connection of humus C to process, id., 109

**vegetable physiology**, Rothamsted 1893, absorption of P results connected with formation & activity of nitrogenous bodies, Gilbert, VI 128, that of K with carbohydrate synthesis, id. 127, that of Ca with accumulation & vegetative processes, id., 129

**vegetable physiology**, Rothamsted 1893, nutrition, K, if easily available stored by wheat in caryopses & leaves, if scarce its content in leaves is reduced, Gilbert, VI, 111, supposit. its need for carbohydrate synthesis, mostly cellulose & seed carbohydrates, id, 127; Rothamsted 1893, absorption of P results connected with formation & activity of nitrogenous bodies, Gilbert, VI 128, that of K with carbohydrate synthesis, id. 127, that of Ca with accumulation & vegetative processes, id., 129

**vegetable physiology**, Rothamsted 1893, nutrition, K, if easily available stored by wheat in caryopses & leaves, if scarce its content in leaves is reduced, Gilbert, VI, 111, supposit. its need for carbohydrate synthesis, mostly cellulose & seed carbohydrates, id, 127;

**vegetable physiology**, root functions, absorption effectiveness depends on efficiency of hairs, it is more effective in upper layers, where chemical elements' presence is higher, deeper roots absorb water but few mineral elements, absorption speediness depends on rapidity of transmission of nutrients from epidermic cells to xylematic ones, Russell, VII, 193-94, absorption is selective, but soil characteristics affects ions balance so that their equilibrium in ashes of the same plant on different soils may vary id., 196

**vegetable physiology**, root development, roots advance putting forward an apex of meristematic cells, which differentiate in epidermid, bark, stalk (endoderm, floem, vessels), epidermid produces hairs, hairs under 10  $\mu$  enter into interstices with 100 mbar suction, in annual spp. root developm. stops after flowering, roots are active at ordinary temperature, winter cereal vegetate at 3° C, at an inferior temper. do not absorb neither water nor solutes, if at field capacity saturated pores are thinner than hairs (in wheat 300-350  $\mu$ ) roots must put forward compressing soil, Russell, VII, 194, if water & nutritional elem. are in the very upper layer, roots development restricts itself in the surface, water absorpt. depth depends on leaves turgor, which must maintain a tension difference sufficient to attract water, id. 195, in pastures roots' depth depends on carbohydr. quantity in their tissues, if grazing is excessive plants are unable to restore supplies & pasture becomes spoiled, id., 194-95

**vegetable physiology**, pH, plants may be divided into calcicoles, calcifuges & calcium indifferent, the discriminating element being the ability to absorb P fixed by Al in acidity conditions, the same sp. can comprehend varieties with opposite properties, some species, like tea, absorbs Al, acidity favours absorption Mn, Russell, VII 210, Ca necessary for meristem & radic. system development, id. VII, 140, in pastures on acidic soils calcifuge are dominant, among which number of nutritionally useless plants, id.,

211, tropic. plants better tolerate low pH, because in warm soils Al do not produce hydroxyls which deliver Al ions, id., 211

**vegetable physiology**, water absorption/yield entity, water volume to produce 1 g dry matter is in inverse proportion to soil wealth, in a poor soil more water is required to obtain the same yield, proofs in jar, Rosanow, VII, 102; water rises to leaves outdoing ducts viscose resistance & cell's membrane reduced permeability, then evaporates from the stomata in measure dependent from the net solar energy received by leaves (excluded any other energy dispersed in the atmosphere, transformed in heat or converted into chemical energy, VII, 187, evaporation is the major component of the summation of converted light energy, the measure was operated by comparison of a green canopy & a water surface taking into account temper., leaves roughness, the degree they are wet, id, 187-88, generally evapor. corresponds to 0,7- 0,8 of loss from water surface, from a luxuriant cultivat. is more than 1, with a suction of 5 mm/die, when water decreases, turgor force increases, stomata are shut, leaves warm up, time for wilthing depends on amplitude of root system, id., 189, tropical species absorb with a force of 15 bar till 4 m deepness, damage of interrupted transpiration is major in plentifully fertilized cultivat. than in those poorly dressed, id., 189, disposable water corresponds to that placed between field capacity & wilthing point, Veihmeyer, id. 190 but the criterion is not valid for all agronomic situations, water lack in crucial phenologic phases (flowering) undoes the rentability of total water during the cultivat. cycle, losses may be contained reducing supply in other cycle-phases id., 190, crops production is proportional to volume of transpired water, transpiration stop reduces production, Ravitz, id., 288

**vegetable physiology**, root exudates: stimulate or depress effects on parasites eggs or spores, effects on same species' or different species' plants, Russell, II, 197

**vegetable physiology**, selectivity radical absorption salts in solut., presence some ions in soils solut. is independent from humidity degree, some are present in an insuff. measure, solut. around roots is rich in not absorbed elements, lacking in readily absorbed elements, Russell, VII, 196, root activity demands O<sub>2</sub> pression within water between 0,6 & 0,2 bar, if CO<sub>2</sub> prevails in soil air it stops metabolism because of toxicity products of bacterial reduction, id., 182

**vegetable physiology**, nutrition, barley P & N absorption lower in adverse growing conditions, higher in plenty yields, Gilbert, VI, 97, the evidence proving the correlation between K presence & carbohydrates synthesis, id., 99, clear relation in beans, id., 127;

**vegetable physiology**, soil solution is in balance with exchange complexes & decomposing rocks, ions diffuse by water convection & diffusion in solution, roots absorb from solids & liquids, some reach roots in quantity major than needs, some in insuff. quantity, Russell, VII, 196, presence ions in roots corresponds to difference between absorption & transfer selectivities, absorbed P is partially kept by roots, ions compete for absorption, high K presence hinders that of Mg, among absorbed ions charge neutrality is preserved. id., 196, solution composition to nourish plants with microirrigation, Noi, VII, 291

**vegetable physiology**, root ability to extract K from clay exchange sites, in jar proves, Boischot, Latuner, VII, 99-100; essential to neutralize cell juices, role in sugar photosynthetic formation, Russell, VII, 140; vegetable physiology, inquiry on effects of minimal & maximal temp. on vital functions, Bustarret, VII, 77

**vegetable physiology**, nutrition, Na conspicuous need, whose function remain unknown, S, protein element, Si, necessary for Gramineae vegetative organs, Cl, necess. to tobacco, Russell, VII, 140, necessity Co & Mo for N symbiotic fixation, conspicuous necessity B for peculiar species, in particular sugar-beet & fruit trees, id., 210, P role in nucleic acid phosphorylation, cellular division premise, Russell, VII, 140-41

**vegetable physiology**, photosynthesis, process key the enzyme RuBisCo, judged "slow", utilizes a minimal light-energy fraction & between 250 & 700 water l. for every kg of synthesized carbohydrates, first proposals to improve efficiency in the '70, first research investment in 90', without any result, because the mutation of the key gene im-

poses a new design for hundreds of subordinate ones; only mathematical modelling may foresee interaction among thousand of genes, a calculation system like that envisaged by Leibniz Institut, can try the goal, VII, 473-74

**vegetable physiology**, nutrition, role microelements, B, Cl, R, Fe, Mn, Mo, Zn, necessary in tiny quantity, dangerous in excess, with varying effects depending on soil nature, Wallace, VII, 75-76; Mo in excess produces an animal pathology, Russell, id., 210; necessity Mg for fruit-trees, damages from lack, De Haas, id., 97; Mg necessary for phosphates transport, Russell, VII, 140

**vegetable physiology**, root apparatus insignificance, being essential only efficiency water and solutes are absorbed, for max. production need to preserve moisture in the earth "bulb" enveloping active roots, whose entity depends on species & age, Broidi, Bilorai, VII, 289-90, technique to substitute field dressing with addition in nutritional solution, Ravitz, VII, 289

**vegetable physiology**, plants able to live in submerged soils, rice & water species have aeriferous ducts in stalk, roots send forth O<sub>2</sub>, which makes them covered by Fe hydroxide & Mn bioxide till flowering, then plant gives out new roots in oxidized inferior layer, Russell, VII, 212-15

**vegetable physiology**, difference ionic equilibria in soil solution, in ashes, in leaves sprouted in different seasons, Russell, VII, 214-15

**vegetable physiology**, N absorption in reduced forms can affect cation absorption & cellular juices pH, Gouny, VII, 101

**veterinary**, history, foundation in Empedocles, developed in Aristotle & Galen works, I, 166; symptoms analysis, illness cause research, Al 'Awwâm, I, 190-91; need to discover diseases causes, Weston, II, 18; '700, foundation in Greek medicine, Mitterpacher, III, 56; a innovative approach, Lavazzeri, III, 59; disease symptoms of mate fundamental species, Onorati, III, 146-48; '800, anatomy & semeiotics developments, Bruni, IV, 360; parallel evolution to human medicine, VI, 38; the perspectives of modern veterinary Perroncito, V, 241

**veterinary**, horse illness, Al 'Awwâm, I, 166, pneumonia semeiotics, id., 190-91; imaginary ills & unlikely medicines, Crescenzi, I, 208

**veterinary**, pharmacopoeia, Cato, I, 39-40; Columella, I, 110; Geoponica, I, 152; Al 'Awwâm, I, 165-66, 191-92; medicaments used against 18th cent. epizooties, Ronconi, II, 226; drugs of the tradition, first chemical compounds, Bruni, IV, 360-61

**veterinary**, dependence every bacteric disease from a specific agent's catabolites, Pasteur, VI, 40

**veterinary**, *Bacillus anthracis*, symptoms, hypothesis microbial agent, empirical therapy means, Perroncito, V, 244-45; discovery of Rayer & Davaine, Koch researchs, first analysis of the blood of dead animals to check Toussaint statement to have discovered the vaccine, Pasteur, VI, 45,, the diatribe kindled by Colin against Pasteur's anthrax experiments on chickens, id., 45, the discovery of a vaccine against the fowl cholera, id., 48, the memoir about Toussaint pretension to have obtained the anthrax vaccin, 21 March 1881 lecture on *Le vaccin du charbon*, id., 53, public demonstration at Pouilly le Fort of the vaccine efficacy, explication of epidemic recurrence in the same pastures, the earth worms role, id, 53

**veterinary**, fowl cholera, symptoms production with filtered infected birds blood, free from cells, Pasteur, VI, 48, the intuition expressed in two paper on vaccination, that pathogenic microbes produce catabolites with antibiotic effects, id., 49

**veterinary**, erysipelas, the precedents, Pasteur, VI, 54, infection tests of pigeons & rabbits, id., 55, the vaccin, id., 55

**veterinary**, vaccination, Jenner vocable meaning extended by Pasteur, VI, 47

**zoology**, complementarity & differences between Darwin's works about selection at nature's state and after animal taming, V 104

**zoology**, inquiry of animal species economic potential, Weston, II, 16, utility to en-

large tamed animal number, id., 23

**zoology**, the operations of organs charged of the key physiological functions, Onorati, III, 147-48

**zoology**, assessment productive potential of animals on the base of morphology, to limit result's dependence by subjective sensitivity, the procedure will be replaced by biometry, V, 240

**zoology**, horse, plurality races, origin unicity, Darwin, V, 111

**zoology**, bovids (bovines & zebuines), origin tame breeds, Darwin, V, 111, selection effects by herder people, id., 112; the most ancient remains of domestic cattle in Thessaly and Macedonia, 8.500 e 8.100 b.p., in F. Crescent at Tepe Sabz dated 7.450 b.p., supposition mating for worship purposes, considering cattle role in Western civilisation, need of deeper research, Reed, VII, 242-43; osteological peculiarities in bovine remains, differences from osteological inventories in domestication areas, were evidence proves killing of parents & capture of calf to be mated, & settlement where domestic cattle are imported, where diggings prove temporal hiatus between last bull killed as a game & first ox utilised for work, Bökönyi, id., 247; bovines & buffalos, regions of first domestication, Herre, Röhrs, id., 250; re-proposition hypothesis domestication for woship purposes, as proved for Asian bovines, Harris, id., 266

**zoology**, *Capra hircus aegagrus*, *Capra hircus Falconeri*, original areas and spreading, Herre, Röhrs, VII, 250

**zoology**, *Ovis*, sheep epidermis characteristics determine wool quality, Cuppari, IV, 369

**zoology**, *Sus*, between Sunda Islands, Scania & Maghreb 25 spp., among which *Sus scrofa*, Herre, Röhrs, VII, 250

**zoology**, dog, evolution from the wolf, prehistoric remains, forms multiplication proved by sculpt., literature & naturalist descriptions, Darwin, V, 108-110, fancier-races, research of exceptional traits, completely ignoring their effects on the whole animal's structure, id., 173; unmistakability of origins, remains' scarcity in F. Crescent settlements, Reed, VII, 242

**zoology**, *Mustelidae* & *Canidae*, anatomy and parasite worms, Redi, II, 24-25

**zoology**, *Rangifer tarandus*, origin & mating regions, Herre, Röhrs, VII, 250-51

**zoology**, peacock, breeding know-how, De Serres, I, 406

**zoology**, molluscs, anatomy, Redi, II, 24

**zoology**, hare, sex anatomy, Redi, II, 23-24

**zoology**, insects, anatomy, Bochart, II, 26; Malpighi, II, 29

**zoology**, bees, the mistery of sexes resolved by Swammerdam, Mitterpacher, III, 71; derision of Spallanzani's envious opposition, Onorati, id., 181; research about sensorial capacities, Bruni, IV, 358-59

**zoology**, silkworm anatomy, key organs, Malpighi, II, 29; Giorgetti, II, 130; silkworm biology, nymph metamorphosis, Giorgetti, II, 134-35

**zoology**, earth-worms, anatomy, Willis, II, 25; the supposed double diet: fresh & decomposed veget., Darwin, VI, 59, nourishment through soil ingestion & trasport to the surface, id., 59, tunnel excavation for displacement, id., 59, mechanism of advancing in the earth, id., 59, the shape of rejection-pinnacles species' peculiarity, id., 59, habits, choice of most convenient point to keep a solid thing, id., 59, submersion of archaeological remains into earth, id., 60, contribution to pedogenesis: confriction rock debris, exposition to CO<sub>2</sub>, contribution to humic acid formation & nitrification, id., 62, worms' place in species evolution, Vallisnieri, II, 25

**zoology**, animal physiology, nutrition, application matter conservation law, Boussingault, IV, 67

**zoology**, animal physiology, 1880, obscurity still existing on rumination process, Perosino, V, 236

**zoology**, animal physiology, knowledge of mammary gland working base to increase cow productivity, Leroy, VII, 67; Thibault, id, 88; inquiry on ovulation & spermatogenesis base for rising prolificacy, Leroy, id., 67; Thibault, id, 88



**zoology**, animal physiology, new feeding procedures from tissues knowledge, Leroy, VII, 66

**zootechny**, taming origins, entity innovation is measurable by number of millennia during which men & animals were only hunters & prey, hunter attitudes are difficult to change, the conversion in habits follows after a millennium the change of climate, the creation of new flint tools, hut settlements, inducing questions about the correlations amongst 3 events, In tamed animals fundamental role of ruminators, which do not compete with man for food, consuming feedstuffs man does not utilize, Reed, VII, 240-41; clear changes in relations age & sex between wild & tamed flocks, calculation statistical significance of the changes by Hopkins, the "taming fever." of the late Neolithic, Bökönyi, id., 245-46; differences between domestic animal and animal maintained after capture, Herre, Röhrs, id., 323; notwithstanding facility relations between man and animal are difficult, for a hunter a beast being solely a prey, animal tending is probably born with the cares of women and children to lambs after the killing of mother, Reed, id., 351, the mass of the straw they consume makes the ruminators a natural complement to grain cultivation, a characteristic survived as long as 10.000 yrs, id., 354

**zootechny, origins**, fire utilised to drive out the game would have foster ruminators' herds, attracted on prairies renewed by ignition, their taming was probably progressive, men following their migration until the day when creation of cereal fields would impose the choice between elimination of competitors or their complete subjugation, the proof in the presence of herds in areas where previously wild ruminators did not exist, Harris, VII, 265-66; with the only exception of guanaco, ruminators tending for milk production was a typical peculiarity of F. Crescent and Northern Africa, id., 266

**zootechny, origins**, correlation with cultivation, combination cultivation & pastoralism in Mesopotamia, Genesis, I, 5, 8, 9; Varro, id., 41; Columella, id. 109; Herrera, id., 221-22; Lombardy, Gallo, id., 279-80; De Serres, id. 387; Onorati, III, 144; prosperity livestock farming in rich countries with large animal produce consumption, Thær, id. 219, cultivation and animal tending synergy is the foundation of rational agriculture, id. 234-35; in China originary alienity of animal husbandry & cultivation, Ping-ti Ho, VII, 253

**zootechny**, cattle farming, tame animals ideotype, Virgil, I, 52; cattle, swine, sheep, Columella, id., 112-13; cattle keeping, practical rules, Al 'Awwâm, id., 185-86; milch cow, Gallo id, 327; De Serres, I, 391; Mortimer, II, 69; limbs' length, Columella, I, 112; in the future of Italian breeds, id., 112; the two different attitudes of bovine breeds (milking & drafting), Columella, I, 115; Mortimer, II, 64; Thær, III, 219

**zootechny**, necessary complement of agricult., Columella, I, 109: feeding, use of farm-trees leaves, Cato, I, 39; as a proof of backwardness of Tuscan zootechny, Ridolfi, IV, 293, 320;; Cuppari, id 372

**zootechny**, cattle breeding, criteria to obtain vigorous oxen, Columella I, 115-16, the breaking out of young oxen, id., 116

**zootechny**, changes in animal structure after taming, Mitterpacher, III, 56; Darwin, V, 105-06, 106-07; differences between wild animal loose control & animal keeping: the former changes the size & only incidentally the structure, the latter, started in Greece & developed in Rome, new peculiar breeds from primitive tame populations, Arcihowskij, Bökönyi, VII, 245, every society establishes a peculiar animal assortment (species, breeds, sex, ages), every one is unmistakable, Bökönyi, VII, 247-48; Roman husbandry practices, Toynbee, I, 44; Columella, id., 110

**zootechny**, 17th century England, need of improving breeds, Weston, II, 17; Young, III, 27-28; ideotype meat cattle & sheep races, Bakewell, id., 28-29; show & auction role, id, 29; '800, fever to reshape all Island's domestic breeds, V, 103

**zootechny, feeding**, need to know every vegetal potential, Weston, II, 17; Thær, III, 232, necessity of a unique measure for feedstuffs nutritional value, the choice of hay as a measure unity, Thær, id., 254-55; objections and successive proposals, Boussingault, IV, 70-71, nitrogen prominence in the fodder's value, De Gasparin, id, 159; every metre

would be valid only for animals of the same species and age, Cuppari, id, 369

**zootechny, feeding**, rational utilisation of forage supplies, Tusser, I, 264

**zootechny, feeding**, the *Grundsätze* compendium of experiences of all 18th century, Thaer, III, 247, cattle keeping, , III, 278, distinction from the survival ration & the production one, Thaer, III, 258-259; the absolute need to give animals the production ration for uninterrupted rentability, in Germany, necess. of forseeing 7 months alimentation at stable, Thaer, III, 223, economic damage of sheep weight losses during winter, id., 259, permanent stalling with feeding by forages from rotation, entity investment & expenses, Thaer, III, 237; Boussingault, IV, 75, 77, 78; rentability selected sheep breeds when plentifully nourished, Thaer, III, 22h

**zootechny, feeding**, expedients for the most economic use of industrial byproducts, Thaer, III, 256, boiling of feedstuffs increases digestibility, id., 257, utilisation brewing residues, procedures, id, 257, use potatoes, id., 258

**zootechny**, 19th century, first clues of separation of animal husbandry & cultivat., use of pastures to dispose of manure for arable land, Boussingault, IV, 66; De Gasparin, IV, 157, night confinement of sheep of migrant shepherds in fields enclosed by nets, id, 238; livestock heavy burden for any farm, but inevitable for need of manure, id, 240; necessity of developing zootechny to reduce its costs, Ridolfi, id, 298-99; De Gasparin, id. 212; "*livestock a necessary evil*", Crud, Sanson (who states the German aphorism's origin), De Gasparin, id. 238-39; advantages to substitute livestock with green-manure, Nebbien, id. 338; new proposal to abandon livestock for green manure, "sideration", Ville, V, 158; contradicting German aphorism statement that efficiency of animal husbandry is the foundation of agrarian prosperity, Perroncito, id. 238

**zootechny**, grazing, incompatibility of different species on the same pasture, Thaer, III, 209

**zootechny**, animal potential assessment, 19th century, visual evaluation on the bases of anatomy, in correlation with morphology, physiology, productive attitudes, Cuppari, IV, 366-67, general characteristics of a prolific animal, id, 369; traits of a lymphatic temperament, typical of meat animals, id, 368; criteria to recognize cattle & swine fattening attitudes, Perroncito, V, 240; end 19th cent., adoption of criteria on the base of biology & statistics, V, 240

**zootechny**, 19th cent. farm animals improvement, the alternative between improved breed import & local races selection, Mitterpacher, III, 56-58; Italy, 19th century, any care lack for traditional breeds, III, 321; Ridolfi, IV, 297-98; comparison with G. Britain and the Low Countries, Perroncito, V, 238-39; local races selection advantages, Predieri, V, 238; Perroncito, V, 239; foreign races import benefits, Zanelli, V, 239

**zootechny**, 19th traits of breeds kept in Naples Kingdom, Onorati, III, 148; in Tuscany, Ridolfi, IV, 296-98; comparison of Italian & foreign breeds, Perroncito, V, 238

**zootechny**, selected animals keeping, G. Britain, feeding in function specific needs, III, 31; Onorati, id., 144; Cuppari, IV, 377; linchpins of modern zootechny: selection, epizooties prevention, buildings rationality, new origin feedstuffs, VII, 296-97

**zootechny**, 20th century, man-animal relationship, from the control of creatures capable of interaction to the keeping of biological entities inable of any reaction, VII, 309-10

**zootechny**, horse, ideotype, coats' colour, I, 187; the perfect form, Al 'Awwâm, id., 188, Alamanni, id., 239; proportions among body parts, Al 'Awwâm id., 188; Alamanni, id., 239

**zootechny, horse**, back & limbs conformation of a saddle animal, Cuppari, IV, 367, back & limbs of a pack-animal, id, 367, breast, back & limbs conformation of a draught animal, id., 368-69

**zootechny, horse**, role in economy, Islam world, I, 165-66; 16th cent. France, De Serres, I, 397

**zootechny, horse**, mare-herd keeping for reproduction, De Serres, I, 397

**zootechny, horse**, colt, separation from mare & starting of training, De Serres, I, 397, meals & drilling during the day, id., 397, bit & saddle imposition, id., 398; behaviour

vices and their emendation, Al 'Awwâm, I, 189-90

**zootechny, cattle farming**, disadvantages of feeding on pasture, benefits on the stable, Weston, II, 17; Mitterpacher, III, 59; Thaer, id. 233-34; comparison of fattening on pastures and at stable, Tessier, id. 250-251

**zootechny, cattle farming**, feeding, integration of hay with salt & oil-cakes, Gallo, I, 328; utilisation of grains depending on comparative prices of food & feedstuffs, Tessier, III, 250; use of residues from the distillation of brandy to fatten oxen, Thaer, id., 257

**zootechny, meat cattle**, U. S., at the end of 19th cent. first herds confined in fenced maize fields in Ohio, slowly the practice displaces itself to Indiana, Illinois, Iowa, Nebraska, at the beginning of 20th cent. it conquered newly irrigated areas in the South, Texas, Arizona, Colorado, California, where the cost of water makes it more profitable to utilise maize at the waxy stage, to feed animals, than wait it to ripen, VII, 301-02, from all of the Corn Belt herds are driven to Chicago slaughter factories along cattle-track crossing the prairie, then it will be the refrigerated waggon to move the meat and Chicago will impose its role as the unique meat-market of the US, id. 303, geography & characteristics of different cattle raising regions in the Confederation, id. 304, Agriculture Department nutrition procedures to mix maize with industrial byproducts to contain feeding-costs, id., 304; after the Second World War the US feeding technology conquers Europe, where "human" grains had been fed to animals, especially to ruminants, id., 297, becoming a common practice to feed cattle and hogs with cereals in the final stages of fattening cycle, id., 297

**zootechny, meat cattle**, France, oxen fattening at pasture in Normandy & Cotentin, at the stable in Anjou & Poiteau, in pastures and then at stable, in Limousin, Tessier, III, 250; comparison of regional methods, id., 251, Boussingault, IV, 77; sucking calves & lamb fattening, feeds & times, Tessier, III., 252

**zootechny, meat cattle**, unavailability elimination of Tuscan Chianina for the inaptitude to fatten, Ridolfi, IV, 295-6

**zootechny, milch cattle**, characteristics of Swiss cows bought by Lombard herdsmen in Swiss valleys, Gallo, I, 325-27

**zootechny, milch cattle**, average head productivity, Gallo, I, 327; De Serres, id., 392; European breeds, Boussingault, IV, 75; correlation between morphology & milking endowment, id, 74-75; Cuppari, IV, 368; Guenon's rules for identifying a good milk-producer, Perroncito, V, 240

**zootechny, milch cattle**, plenty feeding of healthy animals as first profitability condition, Gallo, I, 328; Thaer, III, 219; VII, 66-67; rules for nutrition experiments, Boussingault IV, 71-72, tests of milk production with different diets, id, 75; the compounds of a balanced diet, Leroy, VII, 66-67, the rumen physiology new frontier for a rational nutrition., id, 66

**zootechny, milch cattle**, France 19th century, comparative advantages between keeping sucking calf & cheese production, Boussingault, IV, 74; experiments of calves fattening with milk substitutes, Perrault, IV, 74

**zootechny, milch cattle**, the *American Friesian*, the cow designed to meet the needs of dairy manufactory, 1910, establishment in Washington State first centre to assess bull potential as improvers of milking characteristics of the daughters, pedigree of bulls, VII, 299-301

**zootechny**, the new meat sheep, obtained by Leicester breed, Bakewell, III, 28-29; 18th cent. Sardinia, where ugliness of animals is general because of roughness of faces, Mitterpacher, III, 56, speed in improving a primitive strain, id, 56-57; new selection criteria may surpass the best Spanish Merino, Thaer, III, 223; Italy, Merino introduction, Dandolo, id., 321; quality comparison of different breeds wool, Belic, VII, 88

**zootechny, sheep & goats, herding**, origins, first bones of tamed sheep probably at Zawi Chemi (on the Iranian Zagros), 10.800 b.p., more certain those at Çayönü (south-eastern Turkey), 9.000 b.p., first bones tamed goats Ali Kosh (Iran), 9.000 b.p., uncertainty date remains tamed sheep & goats in Cirenaica, supposed 6.800 b.p., Reed, VII, 242

**zootechny, sheep**, ideotype, Columella, I, 113; wool & meat special races, De Serres, id., 399, selection for breeds improvement, id., 400; new meat breeds

**zootechny, sheep**, transhumance, Varro, I, 44; Provence 16th cent., rules and habits, De Serres, id., 401; between Apulian Tavoliere & Abruzzo, flocks entity & traditions, Onorati, III, 143, privileges of migrant herds, prejudice of agriculture, id., 144, fodder cultivation connecting element between the two economies, Onorati, III, 144; Tuscany, stable feeding without fodder cultivation local agriculture backwardness knot, Cuppari, IV, 372; introduction selected cattle breeds without new forage cultivation would increase losses in livestock economy, Ridolfi, id. 297; the introduction will impose new fodder cultivation, Cuppari, id, 373-74; rentability animal husbandry will increase on the base of a rational forage insertion in rotations, Leroy, VII, 66

**zootechny, sheep & goats herding**, fattening suckling lambs, feedstuffs and times, Tessier, III, 252

**zootechny, sheep & goats tending**, before shearing sheep must be washed in a stream, Tusser, I, 261; herding practices, Gallo, id., 329; right proportion between number tups & females, De Serres, id., 400, the best age for the first tupping & gestation, id., 399, criteria for running large flocks, id., 401

**zootechny, swine**, breed variety, Varro, I, 45; perfect ideotype, Columella, id., 112-13; England, new ideotype after crossing with Chinese breeds, Thaer, III, 221

**zootechny, swine farming**, rational relations between environment, herd size, times of average animal life, Ithaca, I, 21-22; ideal environment, Varro, id., 45; Columella, id., 119; the two pig fattening practices: free roaming in search of feed and in-stable systematic feeding, De Serres, id., 402; new mixed feedstuffs eliminate necessity one only slaughtering season, Thaer, III, 258, The new urban markets impose the choice between production of fat or lean hogs, Thaer, III, 221

**zootechny, swine farming**, promiscuity inconveniences, Columella, I, 120; Onorati, III, 145; acorn rational utilisation, Tusser, I, 262; last fattening in pens with extra feedstuffs, De Serres, id., 402; comparison performances of bands casually formed fed with different mixtures of feedstuffs, Young, III, 31; Thaer, id., 257, 259; influence feeds, milieu conditions, times, Bosc, id., 253, basic need of animals attitude, id, 253

**zootechny, swine farming**, tests Cu as a growth stimulant, ponderal results positive, but residues remain in meat, Buysse, VII, 86

**zootechny, swine farming**, US., in settlers farms hogs scavenge during summer in the prairie, in autumn are confined in fenced maize fields, for the most rapid fattening, then driven to Chicago in large herds conducted by cow-boys, VII, 305, between 1925 & 1945 nutrition science discoveries allow to supplement maize's intrinsic lacks, abandoning free pasture for complete confinement, so creating a new animal industry independent from farmland, research of savings deriving from dimensions would suggest uncising effort for larger concerns, so eliminating minor farms, id., 306, the production specialising in lean hog, an hybrid which must combine precocity to the best carcass qualities, breeds crossed for the purpose, id., 307, the selection a service sold by universities, like the Purdue one (Indiana)308

**zootechny, rabbit rearing**, warren, Estienne, I, 249; De Serres id., 408, shape & length of the fish stream which surrounds it, id., 408; procedures for modern fish farming., Peroncito, V, 240

**zootechny, poultry**, criteria to choose a good breed, Columella, I, 120; De Serres, id., 403

**zootechny, poultry**, field resources & cultivated seeds for intensive bird fattening, Columella, I, 122; natural resources & cultivated crops, De Serres, I, 403, use worms produced by animal offals, id. 403 the economy of hen-house, Columella, I, 121-22; the management of the hen-house, Estienne, id., 250 De Serres id 403, the use of a capon to conduct the chicks, procedure, De Serres, id., 404, artificial hatching and cares for out of season chicks, id. 404

**zootechny, poultry**, thrushes fattening, Varro, I, 45-46; Columella, id., 122; Onorati, III, 145

**zootechny, poultry**, first henhouse for “artificial” fattening, B. Pichat, V, 96-97

**zootechny, poultry** breeding, modern industry, companies connecting genetic selection, facilities for breeding, slaughtering, commercial channels, VII, 309-315, Ross Poultry, a whole designed as a connected-satellites systems every one commensurate to the daily needs of a slaughtering factory, id. 312, space & time relations amongst the cycle segments, id, 312-313

**zootechny, turkey** breeding, the best flock number, utilisation of spontaneous resources and pasture-land, De Serres, I, 405

**zootechny, pigeons**, semi-wild tending, feeding, utilisation natural resources, De Serres, I, 406-07, matter and design for nests, id, 407

**zootechny, pigeons**, breeds number fruit of fancier passion, Darwin, V, 112-113, extraordinary traits research has produced abnormal skeleton changes, id, 124-25

**zootechny, silk-worm farming**, origins, supposed diffusion in classical Greece, Bertagnoli, VI, 210; supposed knowledge in ancient world, Niccoli, VI, 230; 15-16th centuries Lombardy, potentialities, Gallo, I, 335-36; France, Henri IV provisions, De Serres, I, 410-12; suggestion to introduce industry in G. Britain, Weston, II, 19

**zootechny, silk-worm farming**, criteria for adjusting eggs’ quantity to breeding facilities & mulberries number, Ridolfi, IV, 318; the first Italian strains, Gallo, I, 335; times & procedures for eggs incubation, Gallo, id., 335, breeding-rooms requisites, id., 337; Amoretti, III, 77; expedients for providing forward feed, Betti, II, 133; contrivances for leaf feeding, Betti, id., 134; Amoretti, id., 77; need of absolute growth uniformity, Gallo, I, 337; disposition of the “wood” where the larvae will spin the thread for the cocoon, id., 77

**zootechny, silk-worm farming**, cocoon devitalization, De Serres, I, 411-12, cocoon deterioration for improper devitalization, id., 411; Betti, II, 135, perishing for the invasion of a little coleopter, id., 135

**zootechny, silk-worm farming**, contracts for mulberry sharecropping, Gallo, I, 338

**zootechny, silk-worm farming**, facility “degeneration” imported breeds, De Serres, I, 410

**zootechny, silk-worm farming**, the superstitious belief of the possibility to obtain new larvae from a veal carrion, supposed aristotelian foundation, De Serres, I, 410, 435; confutation, Betti, II, 133

**zootechny, silk-worm breeding**, to test egg’s vitality by immersion in a sparkling wine glass, Gallo, I, 336; Betti, II, 133

**zootechny, silk-worm breeding**, worm pathology, *flacherie*, symptoms distinction from pebrine, identific. responsible microorgan., healing, Pasteur, V, 61, 71, 79-80

**zootechny, beekeeping**, supposed reasons to make noise around a swarm, Gallo, I, 334; Ridolfi, IV, 322,

**zootechny, beekeeping**, bees generation without copulation, Virgil, I, 55; generation by a bovine carrion, Crescenzi, I, 209, Herrera, id., 217, spontaneous generation, confutation, De Serres, id., 409

**zootechny, beekeeping**, beehives, multiplicity of materials, Gallo, I, 332, beehives built with squared plancks, effectiveness, id., 332; materials, Ridolfi, IV, 321; patent for a simplified model, Bruni, IV, 359

**zootechny, beekeeping**, honey drawing, to proportion removed quantity to hive needs, Gallo, I, 332-3

**zootechny, beekeeping**, benefits from bee-tending diffusion, Weston, II, 18

**zootechny, beekeeping**, supposed reasons to make noise around a swarm, Gallo, I, 334; Ridolfi, IV, 322,

**zootechny, bees**, Piedmont, peasants’ superstition forbids to sell live beehives, Bruni, IV, 359VIIIVIV, 358-59V, 358-59

**zootechny, bees**, supposition about beehive social rules, Gallo, I, 333-34, the rôle in religious simbology, id., 334

**zootechny, bees**, winter feeding, feeds to be used, Gallo, I, 333; Alamanni, id. 242

**zootechny, fish-farming**, layout & protection coastal pools, Columella, I, 123, feed-stuffs: fishes, fruits, cereals, curdled milk, id., 123, functions of *l'Estang*, *le Pescher*, *le Vivier*, De Serres, I, 408

**zootechny, fish-farming**, pond cycle, De Serres, I, 408, times for frays introduction & mature fish haulage, id., 408

**zootechny, fish-farming**, advantages of exploiting new species, Weston, II, 12; to breed fishes in captivity, B. Pichat, V, 97-98; fruitfulness of salmon-breeding, A. T. Tozzetti, V, 252

**zootechny**, giving up of natural resources exploitation for their technological utilisation, Thaer, III, 223, 234-35