

The contribution of legumes to the diet of English peasants and farm servants, c.1300*

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Abstract

A diet based only on cereals (wheat, rye, barley and oats) and legumes (peas and beans) can be calculated to provide sufficient protein to sustain human life when it contains 18 per cent dry legumes. This percentage is tested against different sources to see if it is applicable for English peasants and farm servants c.1300. Moreover, the percentage of legumes in arable production in the non-demesne sector c.1300 is found to be at least twice as large as in the demesne sector.

Estimates of the size of England's population, c.1300 vary considerably. Scholars agree though that the population reached its highest point in the decades around 1300 after a long period of growth, which had resulted in the intensive use of the available agricultural land. During this period of growth, pasture was converted into arable; the share of more expensive dairy produce and meat declined in the diet of large parts of the population in favour of the much cheaper cereals and legumes. In fact, in terms of both caloric value and protein content, peas were about eight times as cheap as milk or meat.¹ In contrast to the upper classes, who obtained a substantial part of their caloric intake through meat and fish, peasants could only afford to consume small quantities of meat.² Instead, cereals and legumes were the main components of the peasant diet.³ Dyer found evidence for the consumption of, on average, about twelve

* I am indebted to Professor Hoyle and two referees for their valuable comments.

¹ Clark estimated that a pound of meat might have cost 0.59d.; using today's value of 908 kJ for 100g of mutton, gives 0.14d. per 1000 kJ. Milk cost about 1.338d. per gallon; using today's value of 261 kJ for 100g milk, gives 0.14d. per 1000 kJ. Peas cost about 0.514s. per bushel; using today's value of 1366 kJ for 100g (dried) peas, gives 0.017d. per 1000 kJ.

Using today's value of 17.5g of protein per 100g of mutton, gives 0.74d. per 100g of mutton protein. Using today's value of 3.7g of protein per 100g of milk, gives 0.96d. per 100g of milk protein. Using today's value of 22.5g of protein per 100g of peas, gives 0.10 pence per 100g of pea protein. So in terms of both the caloric value and protein value, peas are about eight times as cheap as milk or meat.

For the price of meat, see Gregory Clark, 'Land

productivity in English agriculture, 1300–1860', in Bruce M. S. Campbell and Mark Overton (eds), *Land labour and livestock: historical studies in European agricultural productivity* (1991), pp. 215–7; for the price of milk and peas, see Gregory Clark, 'England, prices and wages since the 13th Century', Global Price and Income History Group, University of California, Davis (2006), gpih.ucdavis.edu/Datafilelist.htm; for today's values, see www.voedingswaardetabel.nl (table of nutritional values).

² Christopher Dyer, *Standards of living in the later middle ages. Social change in England, c.1200–1520* (1989), p. 156.

³ Christopher Dyer, 'English diet in the Later Middle Ages', in T. H. Aston, P. R. Coss, C. Dyer and J. Thirsk (eds), *Social Relations and Ideas* (1983), p. 193.

bushels per person a year.⁴ Corn (cereals and legumes) was used to bake bread, to brew beer and to boil pottage. Of these three, pottage was the cheapest. It was usually made mainly of oats, the cheapest of cereals, of peas and of beans, without any waste.⁵ In contrast, to make bread, the grain had to be milled and baked in an oven; about 20 per cent of the caloric value was lost.⁶ Waste in the process of brewing was even higher, probably about 70 per cent.⁷ Beer, therefore, might probably have been out of reach for daily consumption of the lower classes.⁸ The same holds for bread made of wheat. Wheat, the most expensive of all cereals, was superior to the much coarser bread made of maslin, rye or barley. It is not wholly an exaggeration to say that while the higher echelons ate bread made of wheat, had a high proportion of meat and cheese in their diets and drank beer made of barley, the lower classes ate bread made of barley or rye, ate pottages of oats and legumes, and drank water.

Because of the cheapness of pottage, and because sometimes even legumes were added to the coarser breads⁹, one thus might expect legumes to have had a more prominent role in the diet of the lower class. Indeed, there are indications that the proportion of land sown with legumes was higher on peasant holdings than it was on demesnes. Stone has gathered 12 examples of peasant farms between 1300 and 1450 and has calculated the percentage of sown area under legumes. They were either equal to or higher than the percentage for Norfolk demesnes.¹⁰

This study is devoted to legumes, since they played an essential role in two different ways. On the one hand, they were an important part of a diet based mainly on arable crops, as the right combination of cereals and pulses can create a balanced protein intake. On the other hand they played an important role in the fertilization of the soil by increasing its nitrogen content. In this article the focus is on the first role. In section I a theoretical outline is presented, which is tested against evidence from payments to *famuli* in section II, against maintenance agreements in section III, against the tax list of 1283 from Blackbourne Hundred in Suffolk in section IV, against tithes and demesne output in section V. Finally, comparison of the results are presented in section VI.

I

According to the World Health Organisation (WHO) of the United Nations, adults need, on average, 0.66 gram of protein per kilogram of bodyweight per day. Since this need varies from one person to another, the WHO recommends an intake of 0.82 gram per kilogram, which should be adequate for most adults.¹¹ In our gastrointestinal tract these proteins are broken down into amino acids, which are absorbed in the body and used to build human proteins.

⁴ Dyer, *Standards of living*, pp. 152–3.

⁵ *Ibid.*, p. 154.

⁶ David J. Stone, 'The consumption of field crops', in C. M. Woolgar, D. Serjeantson, and T. Waldron (eds), *Food in medieval England, diet and nutrition* (2006), pp. 13–4; Bruce M. S. Campbell, *English seigniorial agriculture, 1250–1450* (2000), p. 215.

⁷ *Ibid.*, p. 222.

⁸ Dyer, 'English Diet', pp. 203–4.

⁹ Stone, 'Consumption of field crops', pp. 13–7.

¹⁰ David Stone, *Decision-making in medieval agriculture* (2005), pp. 265–6.

¹¹ Since the inter-individual coefficient of variation is 12%, an intake of 0.82 g/kg should be enough for 97.5% of the population. See WHO: technical report series 935: *protein and amino acid requirements in human nutrition* (2007), pp. 150, 180.

TABLE 1. Human requirements for essential amino acids (percentage of total requirement for protein)

	Essential amino acid								
	Isoleucine	Leucine	Lysine	Methionine + cystine ^a	Phenylalanine + Tyrosine ^a	Threonine	Tryptophan	Valine	Histidine
For a child 1–2 years, average	3.1	6.3	5.2	2.6	4.6	2.7	0.7	4.2	1.8
For a child 11–14 years, average	3.0	6.0	4.8	2.3	4.1	2.5	0.7	4.0	1.6
For an adult, average	3.0	5.9	4.5	2.2	3.8	2.3	0.6	3.9	1.5

Note:

^a Not an essential amino acid

Source: calculated from values published in *WHO technical report series 935: protein and amino acid requirements in human nutrition* (2007), pp. 150, 180.

There are 22 different amino acids. Some of these acids are made within the body and others can only be obtained from food: the so-called essential amino acids.

Table 1 gives the WHO's recommended daily intake of all essential amino acids for humans. Table 2 gives the percentages of essential amino acids in several protein-rich food products, based upon data from the Food and Agriculture Organization (FAO). These values, of course, relate to today's products. Following Campbell *et al.*, these values are presumed to have remained constant since the Middle Ages.¹² If one compares Table 1 with Table 2 it is clear that animal protein contains a sufficient amount of every kind of essential amino acid. Most of the plant-based proteins, however, have a deficiency in one or two of the essential acids. In cereals the deficient amino acid is lysine. This is the reason why vegans have to be aware of the lack of lysine in cereals and eat enough lysine-rich products to make up the deficit in their diet. As can be seen in Table 1, the WHO recommends that lysine should form at least 4.5 per cent of the protein intake for adults.

In Table 2 the lysine content is given for cereals and legumes. Cereals like wheat, rye, barley, and oats contain about 3.5 per cent, legumes like beans, lentils, peas and vetches contain about 7.0 per cent. Based on these percentages and keeping in mind the WHO recommendation of 4.5 per cent for lysine, a healthy plant-based diet should contain legume protein to cereal protein in a ratio of 1 to 2.5. Table 2 also includes the protein content of a number of cereals and legumes. Cereals have a protein-content of about 12 per cent, dried legumes about 22 per cent. Keeping in mind the proportion of legume protein to cereal protein mentioned before, a healthy plant-based diet should contain legumes to cereals in a ratio of 100g to 458g. At least 18 per cent of the corn (cereals + legumes) therefore ought to be legumes. In this article this will be called the optimum *legumes-to-all-grains weight ratio*.

¹² Bruce M. S. Campbell, James A. Galloway, Derek Keen and Margaret Murphy, *A medieval capital and its grain supply: agrarian production and distribution in the London region, c.1300* (1993), p. 41.

TABLE 2. Protein content and content of (essential) amino acids in some protein-rich food products

	Grams of Protein per 100 g of foodstuff	<i>Amino acids (percentage of total quantity of protein)</i>										
		Isoleucine	Leucine	Lysine	Methionine	Cystine ^a	Phenylalanine	Tyrosine ^a	Threonine	Tryptophan	Valine	Histidine
Egg (hen's)	12.4	6.3	8.8	7.0	3.4	2.4	5.7	4.2	5.1	1.5	6.8	2.4
Barley (whole seed, hulls removed)	11.0	3.8	7.1	3.7	1.8	2.4	5.5	3.3	3.5	1.6	5.4	2.3
Oat meal	13.0	4.0	7.8	4.0	1.8	2.9	5.4	3.5	3.6	1.4	5.5	2.2
Rye, whole meal	11.0	3.8	6.6	3.6	1.6	2.0	4.7	2.1	3.6	0.8	5.1	2.4
Wheat, whole grain	12.2	3.5	7.1	3.1	1.6	2.7	4.8	3.2	3.1	1.2	4.7	2.5
Bean ^b	22.1	4.2	7.6	7.2	1.1	0.9	5.2	2.5	4.0	1.0	4.6	2.8
Broad bean ^b	23.4	4.0	7.1	6.5	0.7	0.8	4.3	3.2	3.4	0.9	4.4	2.4
Chickpea ^b	20.1	4.4	7.5	6.8	1.0	1.2	5.7	2.9	3.8	0.9	4.5	2.6
Lentil ^b	24.2	4.3	7.6	7.2	0.8	0.9	5.2	3.3	4.0	1.0	5.0	2.7
Pea ^b	22.5	4.3	6.8	7.5	0.9	1.1	4.6	2.7	4.1	0.9	4.7	2.3
Vetch	25.8	3.6	6.9	5.8	1.1	1.0	3.8	2.4	3.3	–	4.0	2.5
Almond, dry	16.8	4.2	7.5	2.7	3.1	1.0	5.8	3.5	2.9	1.0	6.3	2.7
Hazelnut	19.9	7.4	7.3	3.5	0.9	0.5	4.2	4.4	3.1	1.3	7.5	2.1
Linseed	18.0	5.1	7.2	4.5	2.3	2.3	5.7	3.2	4.5	1.8	6.4	2.5
Chicken, edible flesh	20.0	5.3	7.4	8.0	2.5	1.3	4.0	3.3	4.0	1.0	5.1	2.6
Clupeiformes (incl. herring)	20.0	5.3	8.8	9.0	3.1	1.2	4.6	3.9	5.1	1.1	6.1	3.1
Perciformes scombroides (incl. tuna)	27.0	4.4	6.8	8.6	2.4	1.1	3.4	3.6	4.0	1.2	6.6	5.0
Cheese	18.0	5.3	10.4	8.7	2.9	0.4	5.3	5.4	4.0	1.2	7.7	3.1

Notes:

^a Not an essential amino acid

^b Dried, moisture 11%.

Source: calculated from values in *FAO food and nutrition series 21, amino-acid content of foods and biological data on proteins* (1970).

In this calculation cereals and legumes are assumed to be the only sources of protein in the diet. In reality common people also ate cheese, eggs, fish and meat, but in small quantities. As Table 2 shows, these animal food products also contain lysine, which diminishes the need for legumes. However, as the poet Gower complained in 1375 about the demands of the labourers of his day: 'Labourers of old were not wont to eat of wheaten bread; their meat was of beans or coarser corn, and their drink of water alone. Cheese and milk were a feast to them and

rarely ate they of other dainties'.¹³ Because of these small quantities the effect on the optimum percentage of legumes in a healthy diet will be quite small.

The values in Table 2 relate to dried legumes. Medieval sources however do not mention if quantities relate to dried or non-dried legumes. The difference between these two is substantial. A dried pea, for example, contains only 11 per cent moisture, whereas a fresh garden pea contains 75 per cent. Campbell therefore considers it risky to determine the nutritional value of legumes.¹⁴

A dried legume however is not only much lighter and smaller, but can also be preserved much longer. For instance peas that contain a moisture content of 27 per cent and are stored without ventilation at a temperature of 20°C will get mould within a few days. Therefore it is important to harvest them in a dry condition. Nowadays peas are harvested mechanically when the crop has already withered, and the peas have dried until their moisture content is about 20 per cent. When harvesting manually an even lower moisture content is possible.¹⁵ Therefore it seems quite likely that the qualities mentioned in medieval sources relate to dried legumes with a moisture content between 11 and 15 per cent.

To test if the diet of the medieval peasantry could have been healthy if based on arable crops alone, the sources have to be checked for quantities of cereals and legumes. In most of them volumes are given instead of weights. Therefore it is necessary to convert measures of volume into weight measures.

Campbell *et al.* have estimated the density of several cereals c.1300 in a very ingenious way. They estimated the density of wheat in three steps. First they determined how many pounds of bread could be baked out of a bushel of wheat, next they estimated the moisture content of bread and finally they estimated the proportion of the wheat used to make flour. The density of barley and oats they estimated by comparing the costs of transporting these cereals, calculated from two Sheriff's accounts for Hertfordshire and Essex in 1295–6 and 1296–7, to those of wheat.¹⁶ Fortunately their estimates closely match today's values, those of the Joint Committee on Administrative Rules of Illinois (JCAR). The deviation between them is no more than 13 per cent. In this article the JCAR-values are used, complemented by estimates for maslin and for dredge, assuming that maslin is mixed half wheat half rye, and dredge is mixed half barley half oats. These values are given in Table 3. When necessary, the density of peas is used for all kinds of dried legumes.

Information on consumption patterns of the ordinary people is scarce. Scholars have found indications in liveries of *famuli*, in maintenance agreements, in the patterns of production of demesnes, in tithes and in tax lists. All this information is at least one remove from actual consumption. The evidence we have also differs widely from instance to instance. Let me illustrate this with an example of two inhabitants of Culford, a village mentioned in the 1283 tax list of Blackbourne Hundred in Suffolk. According to that list, Adam Capellanus had 1.4 quarters of rye and one quarter of barley in his possession, whereas Herveus Overhe possessed

¹³ Sir William Ashley, *The bread of our forefathers, an inquiry in economic history* (1928), pp. 94–5.

¹⁴ Campbell, *English seigniorial agriculture*, p. 228.

¹⁵ R. D. Timmer, 'Teelt van droge erwten' ['The

cultivation of field peas'], *Teeltandleiding* 28 (1989), pp. 67, 70 and 72.

¹⁶ Campbell *et al.*, *A medieval capital*, pp. 41, 191–4.

TABLE 3. Density, caloric value and price of several crops

Crop	Density in lbs per bushel		Caloric value in kJ per 100 grams ^c	Price c.1300 (1296–1305)	
	c.1300 ^a	JCAR ^b		In s. per bushel ^d	In d. per 1000 kJ ^e
Wheat	53	60	1381	0.625	0.020
Rye		56			
Barley	46	48	1396	0.438	0.017
Oats	36	32	1567	0.259	0.012
Peas		60	1366	0.514	0.017
Maslin		58			
Dredge		40			

Sources:

^a Campbell *et al.*, *A medieval capital and its grain supply* (1993), p. 41.

^b Joint Committee on Administrative Rules (JCAR), Standard Weight Per Bushel for Agricultural Commodities, www.ilga.gov/commission/jcar/admincode/008/00800600ZZ9998bR.html

^c *De voedingswaarde tabel* [table of nutritional values], www.voedingswaardetabel.nl

^d Gregory Clark, 'England, prices and wages since the 13th Century', Global Price and Income History Group, University of California, Davis (2006), gpih.ucdavis.edu/Datafilelist.htm

^e Calculation: $e = \frac{1200000 \times d}{454 \times b \times c}$

one quarter of barley and no rye at all.¹⁷ Adam's case might suggest that, in Culford, rye was more important crop than barley, while Herveus' case might suggest exactly the opposite.

To give another example, as Table 4 shows, the *famuli*, i.e. farm servants, of Wellingborough manor received no legumes at all in 1304, while in 1305 almost half of the liveries were in legumes. Even in two consecutive years the foodstuffs provided might vary considerably. Single instances are potentially a very misleading guide to actual consumption. By selling and buying goods one could fill the gap between production and consumption. A peasant or labourer could sell a product he had in abundance to his neighbour or buy the foodstuffs that he lacked. For large groups, however, this kind of neighbour-to-neighbour trade is averaged out. Therefore one might expect to get a better impression of consumption patterns by determining average values out of a large group of data.

Of course a large group of data does not guarantee a valid result. Every source used in this article brings with it problems that might cast serious doubts on the results obtained. Did, for instance, *famuli* secure their whole diet from their liveries? Are the payments to them representative of the diet of other peasants on the manor? Do maintenance agreements say anything useful about diets of the beneficiaries, who might have had additional sources of income? Do tax lists give an indication of diets, since taxes were evaded and whole groups were exempted? However, while every source can be questioned, taken together they create, as will be seen, a consistent picture of the consumption of legumes. Since they all point to the same conclusion, one can have confidence in the results.

¹⁷ Edgar Powell, *A Suffolk hundred in the year 1283* (1910), p. 135.

TABLE 4. Corn liveries given to the *famuli* at Wellingborough, 1257/8 to 1314

Year ^a	Total volume in quarter							Legumes-to-all-grains weight ratio (%)
	Wheat	Rye	Barley	Dragetum	Oats	Bolemong	Peas	
1257 or 1258		16	41	3	7			0
1266 or 1267	19					28	3	31
1270 or 1271	13		3			3		7
1276	12		20			9	2	14
1280	34		29				9	13
1281	40		3			11	25	38
1282	33		17			6	11	22
1283		36			3	26	15	36
1285	19	17	7			14	15	31
1289	41					12	25	39
1290		32	12			31		19
1291		26	24		15	6		4
1292		25	35			18		11
1295	4	59	8		5	4		2
1297		12	21		15	19		14
1298		36	28			18		10
1299	1	32	21		4	25		14
1302	6	41	15			7		4
1304		68						0
1305		30	8				31	47
1308		55					17	25
1310		34	28				11	17
1312		44			8		24	35
1314		35				6	35	52

Note:

^a The dating given by T. H. Aston, 'The dating of the rolls', in the 1965 reprint has been adopted.

Source: Frances M. Page (ed.), *Wellingborough manorial accounts, A.D. 1258-1323* (Northamptonshire Record Ser. 8, 1936, sec. edn, 1965), *passim*.

Unfortunately, the landless poor are largely absent from these sources. They do not have sufficient possessions to appear in tax lists, nor do they have a job like the *famuli*, and, since they had no land, they would not have a maintenance agreement drawn up when they passed it to their heir. Information on their diet is very scanty. Occasionally details of alms giving offers some insight into the composition of the food they ate, but rarely in a consistent way. On Founder's Day 1340, for instance, Norwich Cathedral Priory gave 18 quarters of wheat to the poor, probably in the form of bread. This bread must have been similar to that which the

monks ate themselves. In contrast, in 1346, the priory distributed among the poor 27 quarters of wheat, 82 quarters of rye, 166 quarters of barley and 82 quarters of peas.¹⁸ This distribution contained hardly any wheat (only 8 per cent); instead, 23 per cent were legumes. However, since it is unknown whether these alms were expected to form the lion's share of the recipient's diet, or were just an important, but small, supplement, these examples can only be used as an indication that legumes were familiar in the diet of the poor.

The use of cereals and legumes as fodder outside the demesne sector is extremely hard to quantify. In this article, therefore, the use of corn for fodder is ignored. How damaging to our argument will this be?

On demesnes, oats and legumes, and sometimes even barley, were used as fodder. Quantities vary considerably from one demesne to another.¹⁹ On average, Wrigley suggests that maybe 30 per cent of the oat harvest was fed to livestock.²⁰ Although this percentage relates to demesne economies, most scholars assume it applies to the non-demesne sector too.²¹ However, this study intends to demonstrate that the two sectors might have differed. What figures can be used for the non-demesne sector?

Campbell states that the use of legumes for fodder on demesnes 'varied considerably, according to local circumstance'. He mentions examples varying from 5 per cent to 45 per cent. Broadberry *et al.* suggest that about 50 per cent of legumes were used as fodder.²² Compared to the examples offered by Campbell, Broadberry *et al.*'s figure seems rather extreme. However, it is quite useful to show that ignoring the consumption of legumes as fodder has only minor effects on the results of this study. Following the suggestions of Wrigley and Broadberry *et al.*, probably about 12.5 per cent of the total demesne harvest was used as fodder.²³ For the non-demesne sector the number of animals per sown acre was probably higher than for the demesne sector.²⁴ However, to cut down costs, peasants might have fed their animals less corn, and more of the cheaper foodstuffs, hay, straw and grass.²⁵ Since these effects work in opposite ways and therefore partly nullify each other, I therefore take the estimate of 12.5 per cent to hold for the non-demesne sector too. The legumes-to-all-grains weight ratio in fodder is estimated to be 32 per cent.²⁶ Since oats were cheaper than peas with respect to their caloric

¹⁸ Ashley, *Bread*, p. 106; Stone, 'Consumption of field crops', p. 18.

¹⁹ Campbell, *English seigniorial agriculture*, pp. 222–9; Robert Trow-Smith, *A history of British livestock husbandry to 1700* (1957), pp. 117–8.

²⁰ E. A. Wrigley, 'The transition to an advanced organic economy: half a millennium of English agriculture', *ECHR* 59 (2006), p. 445.

²¹ Campbell, *English seigniorial agriculture*, pp. 391–6; Wrigley, 'Transition', pp. 442–5; R. C. Allen, 'English and Welsh agriculture 1300–1850: output, inputs and income', paper given at IEHC 2006, XIV International Economic History Congress, www.helsinki.fi/iehc2006/papers3/Allen.pdf, p. 12; Stone, 'Consumption of field crops', pp. 19–21; Stephen Broadberry, Bruce Campbell, Alexander Klein, Mark Overton, Bas van Leeuwen, *British economic growth, 1270–1870* (2015), p. 7.

²² Campbell, *English seigniorial agriculture*, pp. 228–9; Broadberry *et al.*, *British economic growth*, p. 8.

²³ The 'Feeding the city' results (discussed below, section V) show that for demesnes in the FTC counties, about 29% of the demesne harvests was oats, 9% was dredge and 5% legumes. Assuming dredge to have been half barley, half oats, this makes 33.5% of oats. If 30% of the oats was used as fodder, this makes 10% of the harvest; 50% of legumes for livestock makes 2.5% of the harvest to be legumes fed to the animals.

²⁴ Broadberry *et al.*, *British economic growth*, p. 9.

²⁵ John Langdon, 'The economics of horses and oxen in medieval England', *AgHR* 30 (1982), p. 39.

²⁶ Taking 30% of oats and 50% of legumes (see n. 23) gives 10% of the harvest in oats, 2.5% in legumes. Using table 3 gives the mass percentage of legumes for fodder to be 32%.

value (see Table 3), one might expect peasants to have less rather than more legumes in their animals' fodder. The legume content of fodder might therefore not have differed too much from the healthy diet for humans. In addition, since fodder accounted for only a small part of total harvest, the effect of differing percentages of fodder and human diet is less than a few per cent.

So, even when accepting the rather extreme figure of 50 per cent of legumes used as fodder, ignoring the use of corn as fodder will have a minor effect on the outcome of this study.

Finally, attention needs to be given to the reliability of the data. Dodds warns that the data for legumes 'are difficult to use because of the frequency with which they were fed unthreshed to livestock and no quantity for the amount collected entered in the account'.²⁷ In this study this warning can be put to one side, because it concentrates on the use of legumes for human consumption.

II

In accounts of demesnes one can discover what payments were received in money and in kind by the *famuli*, the farm servants hired for the year. Page wrote about them:

The real force to be considered and compared with the tenant-labour, is the service of the lord's '*famuli*'. These were the personal farm servants of the lord ... The '*famuli*' differed from the ordinary administrative officials of the manor, such as the reeve and collector, by being landless labourers housed on the demesne and dependent upon wages, and by being appointed by the '*serviens*' or reeve instead of elected in the manor court.²⁸

Dyer collected liveries of *famuli* from 20 manors in the West Midlands between 1281 and 1349. Together they received 791 quarters of corn, of which 12 per cent was wheat, 13 per cent maslin, 31 per cent rye, 19 per cent barley, 3 per cent dredge, 15 per cent pulses and 7 per cent tollcorn.²⁹ Using Table 3, taking 50 lbs. per bushel for tollcorn, the legumes-to-all-grains weight ratio is calculated to be 16 per cent, quite close to the 18 per cent optimum for a healthy plant-based diet.

Another source of information on the liveries paid to the *famuli* are the account rolls of Wellingborough in Northamptonshire, a manor of Crowland Abbey where we have 26 surviving accounts dated between 1257 and 1323. They record payments to the *famuli* in money and in kind, the payments in kind consisting of cereals and legumes. These accounts make no consistent distinction between full-time stipendiaries and those who received their payments for only a few weeks during harvest-time. Since their payments are sometimes mentioned individually, sometimes grouped together in configurations that change from year to year, it is practically impossible to separate the payments to the casual harvest-workers from those to the full-timers. In this inquiry, therefore, they will be considered as one group.

To get some idea about the payments, in 1299, the eight ploughmen, two carters, one cowherd, three shepherds and one maid received, on average, 5s. and 36 bushels of corn per

²⁷ Ben Dodds, 'Demesne and tithes: peasant agriculture in the late middle ages', *AgHR* 56 (2008), p. 127.

accounts, A.D. 1258-1323 (Northampton Record Ser. 8, 1936, sec. edn, 1965), pp. xxxii-iii.

²⁹ Dyer, 'English diet', pp. 211-2.

²⁸ Frances M. Page (ed.), *Wellingborough manorial*

person. Such a wage must have been enough for one person to live a comfortable life and it might even have been just enough to support a family. The swineherd received much less, only 20*d.* and 17 bushels of corn. In the autumn of that same year the manor hired one extra carter, six tithe-gatherers and one stacker. They received for their work in harvest-time on average 20*d.* and three bushels of corn each.³⁰

Table 4 gives the total volumes for 24 years. Two years are omitted. The account of 1307 does not record which kind of corn was used for a large part of the payments in kind, which makes it useless for our purposes. The account of 1322 mentions such small quantities – less than five quarters in total for sixteen people – that it cannot give any reliable picture of what the *famuli* consumed in that year.³¹

Special attention is needed for one of the mentioned crops, bulmong. Rogers calls it a mixture of oats, peas and vetches. Stone describes it as a mixture of oats, beans and peas. Campbell says it is 'pea based, sometimes bean based, and sometimes vetches were included, but the grain component was almost invariably oats'. William Harrison, writing in the third quarter of the sixteenth century, described it as 'peas and beans sown together, tares and oats'.³² For the purpose of calculation, this study assumes that the Bulmong was half oats, half peas.

As Table 4 shows, the distribution of the percentage of legumes in the liveries is quite wide. In 1257 and in 1304 it was zero, in 1314 it was as high as 52 per cent. On average it is 20 per cent, the median being 16 per cent. In spite of the large dispersion, both mean and median are quite close to a healthy plant-based diet.

III

When a peasant retired from active cultivation, or a widow relinquished management of her land for a share of its produce, a maintenance agreement might be drawn up which was registered in the court rolls.³³ Sometimes specific quantities of cereals and legumes were mentioned. In 1247 Simon de la Strate of Park manor of the liberty of St Albans (Herts.), surrendered his land for the use of his son Alexander, on condition that he provided his father with food and drink, that he annually gave him a tunic (worth 2*s.*) and 6*d.* for shoe-repairs. However, if Simon found his son unwilling to fulfil his bargain, Alexander agreed to give his father half a quarter of winter crop and one quarter of oats annually, besides the tunic and the shoe-repairing.³⁴

To give another example, in Warboys in 1343, Bocharus Rolf, tenant of a yardland in Caldecote, waived all claims to the inheritance of the land that had once belonged to his father, for the benefit of William le Loonge, in return for a ring of wheat, two bushels of dredge and two bushels of peas annually. In addition, Bocharus was allowed to use one acre of the land for as long as he lived. After the death of his mother he had at his disposal the messuage with the house where she lived at the time of the agreement. However, when he died, 'all the above

³⁰ Page (ed.), *Wellingborough manorial accounts*.

³¹ *Ibid.*, pp. 95–6, 129–31.

³² Stone, 'Consumption of field crops', p. 17; William Harrison, *The description of England*, ed. Georges Edelen (1968), p. 434; Campbell, *English seigniorial*

agriculture, p. 227; T. Rogers, *A history of agriculture and prices in England*, I, 1259–1400 (1866), p. 27.

³³ Dyer, 'English diet', p. 197.

³⁴ A. E. Levett, *Studies in manorial history* (1938), p. 306.

quarter of corn, acre of land, and messuage shall entirely devolve to the above William and his heirs so that neither the widow nor children of the same Bochardus should receive anything'.³⁵

Unfortunately, one cannot be sure that the food mentioned reflects the diet of the beneficiaries like Simon de la Strate or Bochardus Rolf. As Dyer states, they might have had other means to acquire income, such as earning wages or keeping animals.³⁶ They might have sold part of their allowances as explicitly mentioned in the maintenance agreement of Walter, in Ellington (Cambs.) in 1278, who was given by his son William Koc six bushels of wheat, two bushels of barley and two bushels of beans and peas twice a year, at Michaelmas and at the feast of the Purification of Blessed Mary. 'And the same Walter, to assure the above agreement, and for licence to withdraw from the village with his chattels, paid the lord abbot annually 2s. from the above grain'.³⁷

Dyer collected 83 maintenance agreements registered between 1240 and 1458, of which 70 were made between 1248 and 1349. In total these agreements gave their beneficiaries a yearly maintenance of over 198 quarters consisting of 47 per cent wheat, 4 per cent maslin, 7 per cent rye, 20 per cent barley, 3 per cent dredge, 11 per cent oats, 9 per cent pulse and 1 per cent unspecified.³⁸

The prominence of wheat, forming almost half of the total, is striking. To illustrate how high this is: Campbell found a much lower percentage of 29 per cent for demesnes in the environs of London.³⁹ As to why, one can only speculate. Could it be that the elderly ate more wheat than the young, because bread made of wheat was easier to digest than coarser bread? Could it be that they wanted it in such large quantities in their allowances since it was very suitable as a cash crop?

Neglecting the unspecified part, the legumes-to-all-grains weight ratio is only 10 per cent. Clearly this is less than the desirable percentage for a healthy plant-based diet. However it is important to notice that these maintenance agreements are not only drawn from the average, or poorer, members of the peasantry but also from the more prosperous members of society. In addition, if we accept the possibility that the wheat was partly sold for cash, then pulses might have formed a larger part of the recipient's diet. If, for instance, they sold half their wheat, the percentage for legumes would raise from 10.0 to 13.5 per cent.

IV

In late January 1283 the whole of England was assessed for a taxation to be levied at a thirtieth part of each man's movable goods. Movable goods included oxen, cows, pigs, sheep, cereals, peas and beans and possessions that could be transferred from place to place, but 'treasure, riding horses, bedding, clothes, vessels, tools, geese, capons, hens, bread, wine, beer, cider and all kinds of food provided and ready for use' was expressly excluded.⁴⁰ We must assume that

³⁵ Translation from Latin by J. Ambrose Raftis, *Tenure and mobility: studies in the social history of the mediaeval English village* (1964), pp. 44, 221. A ring was half a quarter, see Rogers, *History of agriculture and prices in England*, I, 1259–1400, p. 168.

³⁶ Dyer, 'English Diet', p. 198.

³⁷ Raftis, *Tenure and mobility*, pp. 45, 221.

³⁸ Dyer, 'English Diet', p. 201.

³⁹ Calculated from the aggregate net crop yields, given in Campbell, *English seigniorial agriculture*, p. 216.

⁴⁰ Powell (ed.), *Suffolk Hundred*, p. xi.

farming equipment (ploughs etc.) and household goods (such as cooking vessels) were also held to be exempt, since they are not mentioned at all on the tax list. Unfortunately most of the lists have been lost but those for Blackbourne Hundred in north-west Suffolk have survived. Powell has tabulated the possession of cereals, legumes and livestock for all of the 1393 taxpayers that are mentioned in this tax list.⁴¹ The poor were exempted from this tax, the lower threshold being half a mark.

The detailed information on individual taxpayers makes this source very attractive to historians; but they have long had doubts about the reliability of the data. In his comprehensive study of parliamentary taxes between 1290 and 1334, Willard stated that any cereals and legumes that were assessed were the surplus that the peasant had for sale. The part that was stored for family consumption, for fodder and for seed, would have been exempt. His argument is built upon the observation that the quantities of grain recorded are very small. He mentions averages per capita for a few villis, varying from 12 to 70 bushels. They might have been sufficient as food for the household, but not enough to use as fodder and to sell for cash to make necessary payments.⁴² Langdon shares this line of reasoning. Glasscock and Hadwin find it a plausible explanation, although by no means proven or certain.⁴³ However Postan thinks that the corn assessed was 'the grain found in their possession or sown on their land, but not yet gathered as a crop'. He notes 'that the tax list for the village of Walsham le Willows had been returned from the Exchequer in order that the grain sown in the autumn should be included, as it should have been if the instructions had been faithfully observed'.⁴⁴

The second major objection to the reliability of the data contained in the tax list is, as Hadwin states, 'it seems likely that nearly everyone participated, to some degree, in undervaluation'.⁴⁵ When comparing county totals for the assessments between 1275 and 1334, with taxes varying between the Thirtieth (1283) and the Tenth and Sixth (1294 and 1322), he finds that 'the temptation to cheat was greatest when the fraction of one's wealth being demanded in tax was largest'.⁴⁶ In addition to this effect, one might assume that tax evasion was much more common after 1297 than it was before 1294. Until 1294 this kind of taxes were imposed at fairly long intervals (1275, 1283, 1290). However from 1294 to 1297, taxes were levied annually. This must have made people creative in finding ways to avoid paying tax. Once learned, they might have used the same trick again when having to face new taxations.⁴⁷

How relevant are these objections to the list of 1283? To start with the second objection, compared to the taxes from other years, this tax, the Thirtieth, was relatively mild. Since it was also one of the earlier taxes, Hadwin expects that tax evasion was relatively small.⁴⁸ In addition, this study is not about absolute quantities of cereals and legumes, but instead about

⁴¹ Ibid., pp. 122–200.

⁴² J. F. Willard, *Parliamentary taxes on personal property, 1290 to 1334* (1934), pp. 81–5.

⁴³ John Langdon, *Horses, oxen and technological innovation: the use of draught animals in English farming from 1066 to 1500* (1986), pp. 179–80; Robin E. Glasscock, *The lay subsidy of 1334* (1975), pp. xxv–xxvi; J. F. Hadwin, 'The medieval lay subsidies and economic history', *ECHR* 36 (1983), pp. 204–5.

⁴⁴ M. M. Postan, 'Village livestock in the thirteenth century', *ECHR* 15 (1962), pp. 220–1.

⁴⁵ Hadwin, 'Medieval lay subsidies', p. 205; Langdon, *Horses, oxen and technological innovation*, p. 182.

⁴⁶ Hadwin, 'Medieval lay subsidies', p. 208.

⁴⁷ Willard, *Parliamentary taxes*, p. 345; Langdon, *Horses, oxen and technological innovation*, p. 184.

⁴⁸ Hadwin, 'Medieval lay subsidies', p. 213.

the relative proportions of cereals and legumes. If cereals were under-assessed as much as legumes, it would leave the proportion unaltered.

The first objection states that only the surplus left after a household had paid tithes and used corn for seed, for human consumption, and for fodder, was taxed. Willard's remark that one needed a surplus to sell to raise the cash used for necessary payments is based on the idea that such a household could live on their lands alone. Suffolk, however, was a densely populated county. Out of 7337 tenancies of manors of Bury St Edmunds in 1285, 72 per cent were found to have been ten acres or less, of which 41 per cent had five acres or less. Kanzaka's analysis of the Hundred Rolls of 1279–80 reveals that, for the neighbouring county of Cambridgeshire, 72 per cent of free holdings, and 48 per cent of villein holdings, were smaller than six acres.⁴⁹ Subdivision and subletting led to an even higher degree of fragmentation of the land. Even as late as 1370–83, when the Black Death and subsequent epidemics had reduced population pressure, the majority of the holdings in Suffolk were of five acres or less.⁵⁰ In addition to the production of their land, therefore, the majority of the peasants must have had other sources of income, like wage work. It is thus not surprising that at least part of the presumed surplus is lacking in the tax list.

A rough estimate shows that an average family needed about nine acres of sown land to have enough corn for family use.⁵¹ If one accepts Willard's argument, that only the surplus was being taxed, one has to assume that every household that was assessed for corn must have sown at least these nine acres, since otherwise it would not have had any surplus of corn. Of the tax list, 1300 out of 1393 taxpayers were assessed for corn. Langdon has compared the tax list with a number of contemporary records: he has found that in some villages at least 30–35 per cent of the households were missing.⁵² Taking this figure to hold for the Hundred as a whole, there would have been about 2142 households in Blackbourne Hundred. Based on these figures, at least 60 per cent of the households would have had more than nine sown acres. This percentage must have been even higher, since some of the missing households must have had possessions above the threshold of half a mark. Sixty per cent is quite high, compared to what might be expected for this region and this must cast doubt on Willard's argument.

⁴⁹ Junichi Kanzaka, 'Villein rents in thirteenth-century England: an analysis of the Hundred Rolls of 1279–1280', *EcHR* 55 (2002), p. 599; Bruce Campbell, 'The agrarian problem in the early fourteenth century', *Past and Present* 188 (2005), pp. 51–62.

⁵⁰ John Hatcher and Mark Bailey, *Modelling the middle ages, the history and theory of England's economic development* (2001), p. 45; Christopher Dyer, *Everyday life in Medieval England* (1994), p. 223.

⁵¹ Assume that 25% of the harvest was reserved for seed, 10% for tithes, 12.5% for fodder. A household without surplus would then use 52.5% of its corn production for human consumption. Taking five persons per household and twelve bushels corn per person as supply for a year gives 60 bushels for human consumption, and, since this is 52.5% of total production, this household would have needed 114 bushels for family

use (seed, human consumption and fodder) and tithes. When sowing just barley, the corn with the highest yield per acre (about 15 bushels per acre), the average peasant should have had at least 7.6 acres of sown land to produce a yield of 114 bushels. Since he cultivated other crops as well, a sown area of about nine acres is more realistic. For the number of persons per household, see Cicely Howell, *Land, family and inheritance in transition*, Kibworth Harcourt, 1280–1700 (1983), p. 235; N. J. G. Pounds, *An historical geography of Europe* (1990), p. 147; for the median quantity per person, see Dyer, *Standards of living*, p. 152; for the yield per acre of field crops, see Broadberry *et al.*, *British economic growth*, appendix, p. 30.

⁵² Langdon, *Horses, oxen and technological innovation*, pp. 184–5.

As mentioned above, Willard's argument was based upon averages per capita for a few villis, varying from 12 to 70 bushels, for the assessments between 1290 and 1334. Based upon the figures of Powell, Bailey has calculated the average for the Blackbourne taxlist of 1283, to have been 56 bushels per taxpayer.⁵³ At first sight, this result might be quite comparable to the figures that Willard mentions, and Willard's argument therefore might seem to hold for the taxlist of 1283 also. However, Willard's figures relate to assessments at Michaelmas, whereas the assessment of 1283 was meant to assess all movable goods at the octave of St Hilary, i.e. four months after Michaelmas. In these four months, about one third of the corn that was stored for family consumption and fodder, would already have been consumed, and part of the seed was already sown.

To shed light on the subject, a rough estimate how much corn was needed for human consumption, fodder, seed and how much might have been transported out of the Hundred, shows that the harvest of Blackbourne Hundred should have yielded some 200,000 bushels of corn.⁵⁴ Of this quantity, 37 per cent was mentioned in the tax list and 23 per cent was already consumed by man and animal. This, then, leaves a gap of 40 per cent missing. This seems to be quite high, compared to the 15 per cent shortfall that Langdon calculated for missing draught animals in this same list.⁵⁵ However, the gap would be filled if we assume that seed was not assessed. For Willard, exemption of seed seemed entirely reasonable: 'it is highly probable that seed corn would also be excused on the ground that it was a part of his waynage and needed for "carrying on the agriculture which was his livelihood"'.⁵⁶ If we make the assumption that seed was not assessed, then about 15 per cent of the corn harvest is missing from the tax list. Part of this might already have been transported out of the region, part might have been omitted due to evasion, part might have been exempt. I therefore find it plausible to suppose that, in 1283, grain reserved for household consumption and fodder was not exempted, but seed was.

According to the tax list, part of the population had very small quantities of corn in their possession, surely not enough to feed more than one person. They could have obtained more corn during the year by payment in kind, by buying it at the market or by receiving alms. As their possession must have been just a very small part of their consumption, it might not reflect their consumption pattern. Therefore, they are left out of account, putting a lower threshold at 1.5 quarters. That leaves 1103 taxpayers.

Before calculating the yearly consumption, one last issue has to be addressed. Blackbourne is

⁵³ Mark Bailey, *A marginal economy? East Anglian Breckland in the later Middle Ages* (1989), p. 137.

⁵⁴ Assuming the previously calculated 2142 households consisted of five persons per household, this would lead to a total population of a little over 10,000 for the whole region. At twelve bushels per person, this would make a total of 120,000 bushels a year needed to feed the population of the Hundred. Please note that one does not have to take into account the surplus that households sold for cash to be able to make necessary payments, since what one sells, the other buys. The surplus of the Hundred as a whole, the corn that was transported out of the region, surely must have

been just a small percentage of the harvest, perhaps no more than 5%. Note too that tithes no longer have to be treated as a separate category, since corn that is gathered as tithes ends up as food, fodder, seed or is transported.

Using the figure of 12.5 per cent for fodder and 25 per cent for seed, results in about 57.5 per cent of the harvested corn to have been used as food for humans. The total harvest can then be calculated to have been about 209,000 bushels of corn.

⁵⁵ Langdon, *Horses, oxen and technological innovation*, p. 184.

⁵⁶ Willard, *Parliamentary taxes*, p. 82.

TABLE 5. Taxpayers of the High Suffolk region of Blackbourne hundred, 1283, possessing more than 1.5 q of corn, subdivided in ten percentiles according to the total value of their possessions (n=862).

Percentile	Total value in s.	Average possession according to the tax list (in kg)		Legumes-to-all-grains weight ratio		
		Cereals (kg) ^a	Peas and beans (kg) ^a	^b	^c	^d
1st	8–15	334	75	18.4	16.6	17.7
2nd	15–20	362	112	23.5	17.8	19.4
3rd	20–25	476	112	19.1	15.3	17.0
4th	25–30	570	161	22.1	15.5	17.0
5th	30–35	649	177	21.5	18.7	20.5
6th	35–42	802	206	20.4	15.5	17.4
7th	43–51	948	253	21.1	16.5	18.4
8th	51–65	1213	265	17.9	13.2	15.1
9th	65–92	1601	300	15.8	12.0	13.7
10th	92–1242	5507	1009	15.5	11.4	13.3

Notes:

^a Average possession per taxpayer, according to the tax list

^b Calculated directly out of the quantities mentioned in the tax list without correcting for seed

^c Calculated by computing the yearly consumption and assuming that sown winter seed was not counted in the tax list

^d Calculated by computing the yearly consumption and assuming that sown winter seed was counted in the tax list.

Source: Calculated from the quantities mentioned in the tax list of Blackbourne Hundred in Edgar Powell, *A Suffolk hundred in the year 1283* (1910).

a hundred that consists out of two quite different kind of regions: the one region being a part of Breckland, an area of poor sand and heaths where animal husbandry, especially of sheep, was very important; the other region being a part of High Suffolk, an area of arable farming.⁵⁷ As these two areas are so different, they will be treated separately.

In High Suffolk the 1283 tax list mentioned 862 taxpayers who owned more than 1.5 quarters of corn. In Table 5 they have been subdivided in ten percentiles, arranged to their total value of possession. The legumes-to-all grains weight ratio has been calculated under three different assumptions: first directly out of the quantities mentioned in the list without correcting for seed, next by computing the yearly consumption and assuming that sown (winter) seed was not counted in the tax list, finally by computing the yearly consumption and assuming that sown (winter) seed was counted in the list.

Technical details of the calculation of the corrections for the last two assumptions are found in the appendix. In all three cases the overall percentage of legumes appears to be constant in the first seven percentiles. In the last three percentiles it is a little lower. The differences

⁵⁷ Mark Bailey, *Medieval Suffolk, an economic and social history, 1200–1500* (2007), p. 2.

between the three computations are limited. In the first one the legumes-to-all grains weight ratio is 21 per cent, in the second it is 17 per cent, in the third it is 18 per cent. In all three the result is quite close to a healthy diet based on arable crops alone.

For the Breckland region the picture is completely different. As Bailey shows, on Breckland soil very little wheat and legumes were grown, since a taxpayer in this region had on average only 1.3 per cent of his grains in wheat and only 2.6 per cent in legumes.⁵⁸ Undoubtedly this must have been related to the soil type of this heathland area. Drought is a severe problem on these infertile sands, which makes it hard to cultivate peas and beans.⁵⁹ Barley, rye and oats are more tolerant of difficult circumstances; therefore it was these crops that were cultivated in larger quantities. What, however, are the consequences of these marginal soils for consumption? The evidence of the tax list is that the common people of this region scarcely possessed any legumes, but held more sheep than in the High Suffolk region. Taxpayers in Breckland who possessed less than 51s., had on average 8.6 sheep compared with 3.5 in the High Suffolk region. Therefore it seems likely that they ate hardly any legumes but consumed more milk, cheese, butter and meat. However there are three lines of argument against large differences in consumption patterns between the two regions. Firstly, the two regions are adjacent to each other. In Blackbourne, the distance between a Breckland village and High Suffolk is no more than ten miles. It seems highly improbable that these two regions, so close to each other, could have such different food cultures, especially because most sheep in Breckland were not in the possession of peasants, but instead are in the possession of the rich. To illustrate this, the wealthiest percentile owned 45 per cent of all the sheep. Second, comparing the percentage of legumes for an average demesne in High Suffolk to an average demesne in England, legumes are more important in High Suffolk than elsewhere in England. Assuming that part of the crop was sold, there must have been a considerable supply of legumes in the vicinity of Breckland. Third, animal products were quite expensive compared to legumes.⁶⁰ Therefore it seems reasonable that peasants and labourers sold a large part of their animal products and bought cheaper legumes for consumption. Because of these arguments it is improbable that these low levels of production accurately reflect the balance of crops consumed.

V

One tenth of the yield was taken as tithe for the church. In accounts of the Durham priory between 1350 and 1450 Dodds found 278 accounts which mentioned which field crops were gathered. Overall these broke down into 25 per cent wheat, 29 per cent barley, 18 per cent peas and beans, and 24 per cent oats, all in volume percentages.⁶¹ Assuming the remaining 4 per cent to have been rye, and using Table 3, the legumes-to-all grains weight ratio is 21 per cent, just a few per cent above the optimum for a healthy plant-based diet.

In the research project 'Feeding the City', which concentrate upon food production for London around 1300, data were collected on the production of manors in ten counties in

⁵⁸ Bailey, *Marginal economy?*, p. 137.

⁵⁹ Timmer, 'Teelt van droge erwten', pp. 20–1.

⁶⁰ See n. 1.

⁶¹ Ben Dodds, 'Tithe and agrarian output between the Tyne and Tees, 1350–1450' (University of Durham Ph.D thesis, 2002), p. 145.

TABLE 6. Volume percentages of legumes in corn in collected tithes and in demesne-yields

	<i>Legumes in Tithe</i>		<i>Legumes in demesne-yield</i>		<i>Ratio</i>
	<i>n</i>	<i>%</i>	<i>n</i>	<i>%</i>	
Eastry (Kent)	29	10	24	6	1.7
Monkton (Kent)	31	6	18	0	∞
Birchington (Kent)	31	8	–	–	–
Hambledon (Hants.)	39	5	50	3	1.7
East Meon (Hants.)	27	5	51	0	∞
East Meon Church manor (Hants.)	–	–	43	1	–
Feering (Essex)	39	8	36	5	1.6

Source: Ben Dodds, 'Demesne and Tithe: peasant agriculture in the late middle ages', *AgHR* 56 (2008), p. 137.

London's provisioning zone.⁶² Campbell gives the distribution of crops produced by the demesnes in the 'Feeding the City' counties between 1288 and 1315 as 29 per cent wheat, 6 per cent rye, 3 per cent winter mixtures, 18 per cent barley, 9 per cent dredge, 29 per cent oats, 1 per cent miscellaneous grains, 5 per cent legumes, all volume percentages.⁶³ Using Table 3, taking 58 lbs./bushel for the winter mixtures and neglecting the miscellaneous grains, we get a legumes-to-all grains weight ratio of 7 per cent. If a non-demesne to demesne ratio can be determined for legumes, it can be used to calculate the percentage for the non-demesne sector out of the result for the 'Feeding the City' counties.

Dodds has used tithe receipts to compare the production of cereals and legumes by peasants to that of demesnes for six parishes in south-eastern England. From his results, the non-demesne to demesne ratio is calculated in Table 6. It is clear that legumes play a much bigger role in the non-demesne sector.

The 1283 tax list too can be used to determine this ratio, as it not only gives the possessions of each taxpayer, but also their name. These names are used to divide the taxpayers into a demesne sector (names containing dominus, prior, abbas), and a non-demesne sector (everyone else). In Table 7 the volume percentages for both sectors and the ratio are given per parish. The median of the ratio is 1.9. As legumes played a bigger role in the non-demesne sector, the true value of the ratio probably lies somewhat higher than the above mentioned 1.9, since some taxpayers might have been classified incorrectly, which raises the percentage of the demesne sector when someone is reckoned to this sector incorrectly, or lowers the percentage of the non-demesne sector when a demesne is reckoned to this sector. In both situations the ratio is lowered. Based on the findings of Dodds and those for Blackbourne a ratio of two to three seems reasonable.

Combining this result with our estimate of 7 per cent legumes for the demesne sector, gives a percentage for the non-demesne sector of at least 14 per cent, which is a few per cent below the optimum for a healthy plant-based diet.

⁶² Campbell, *English seigniorial agriculture*, pp. 31–2.

⁶³ Percentages are calculated out of the aggregate

net crop yields, given in Campbell, *English seigniorial agriculture*, p. 216.

TABLE 7. Volume percentages of legumes in corn in the 1283 tax list of Blackbourne Hundred

<i>Parish</i>	<i>Volume legumes in corn (%)</i>		<i>Ratio</i>
	<i>Non-demesne sector^a</i>	<i>Demesnes^a</i>	
Ashfield Magna	24.4	18.5	1.3
Ashfield Parva	19.4	0.0	∞
Bardwell	11.4	6.0	1.9
Barnham	0.3	3.7	0.1
Barningham	19.4	19.0	1.0
Culford	1.6	0.0	∞
Elmswell	12.9	2.7	4.8
Fakenham	3.9	0.0	∞
Hepworth	17.3	17.1	1.0
Hinderclay	16.4	8.5	1.9
Hopton	2.3	0.0	∞
Ingham	1.1	0.3	3.7
Ixworth	2.7	1.5	1.8
Market Weston	18.7	100	0.2
Norton	21.9	9.0	2.4
Rickinghall Inferior	19.1	12.8	1.5
Rushford	2.8	0.0	∞
Stanton	10.4	13.3	0.8
Thelnetham	26.4	8.5	3.1
Thorpe	11.8	11.4	1.0
Walsham	35.7	30.8	1.2
Wattisfield	26.2	12.5	2.1

Note:

^a taxpayers whose names contain 'dominus', 'prior', 'abbas' or 'manerium' are reckoned to the demesne sector, all others to the non-demesne sector

Source: Calculated from the quantities mentioned in the tax list of Blackbourne Hundred in: Edgar Powell, *A Suffolk hundred in the year 1283* (1910).

VI

Despite large ranges found in all the sources we have used, there is a remarkable agreement between them over the average percentage of legumes. Except for the maintenance agreements, all averages lie quite close to the requirements of a healthy plant-based diet. As noted before, since the proportion of wheat that is mentioned in the maintenance agreements was exceptionally high, part of this wheat was probably used to for sale, which would bring the legumes-to-all grains weight ratio more in line with the other results. This study therefore makes it plausible

TABLE 8. Summary of the different results

<i>Description</i>	<i>Period</i>	<i>Percentage of legumes</i>
Liveries of <i>famuli</i> of 20 demesnes (Dyer)	1281–1349	16
Liveries of <i>famuli</i> in 26 Wellingborough accounts	1257–1314	16–20
83 maintenance agreements (Dyer)	1240–1458	10
278 tithe receipts Durham priory (Dodds)	1350–1450	22
Tax list of Blackbourne hundred, non-Breckland	1283	17–21
Demesnes FTC counties (Campbell), combined with the non-demesne sector to demesne sector ratio	1288–1315 1288–1348	14

Sources: Christopher Dyer, *Standards of living in the later middle ages. Social change in England, c.1200–1520* (1989); Frances M. Page (ed.), *Wellingborough manorial accounts, A.D. 1258–1323* (Northamptonshire Record Ser. 8, 1936, sec. edn, 1965); Ben Dodds, 'Demesne and tithe: peasant agriculture in the late middle ages', *AgHR* 56 (2008); Edgar Powell, *A Suffolk hundred in the year 1283* (1910); Bruce M. S. Campbell, *English seigniorial agriculture, 1250–1450* (2000).

that the diet of peasants and farm servants achieved such a diet. A supplement of meat and dairy products was not required to stay healthy. Unfortunately, the sources used do not show if the diet of the poor matched such a diet too, since they do not appear in these documents. One can only presume that such a diet would have been in their reach, since it could consist of rye, barley, oats and legumes, which were the cheapest foodstuffs.

In the non-demesne sector legumes played a role twice as big as in the demesne sector. Since the yield per acre of legumes was lower than those of cereals, the proportion of land devoted to peas and beans should have been at least 11 per cent to produce so much legumes. Such a proportion of the acreage sown with legumes would not be found again until the seventeenth century.⁶⁴ Undoubtedly this must have had a positive effect on the fertility of the soil and on the yield of the seed. The results of this article, therefore, support Stone's assumption that yields per crop on peasants' land were higher than those on demesnes.⁶⁵ However, since yields of legumes were lower than those of cereals, the effect on the mean yield per acre might be partly mitigated.

Since legumes played a much bigger role in the diet of the lower class than was presumed until now, the framework used by Campbell and by Stone for estimating population size c.1300, based on the production and consumption of wheat, rye, barley and oats, should be adjusted to include legumes. Such an adjustment is beyond the scope of this study. To be able to undertake such an adjustment requires more knowledge of the diet of the poor and of the need for legumes in the more pastoral regions, where dairy products and meat might have been more prominent in peasants' diet. But to give legumes more weight in the diet goes some way to explaining how the prevailing levels of agricultural technology could support the population of England at its medieval peak before the collapse of the late 1310s.

⁶⁴ Broadberry *et al.*, *British economic growth*, p. 30.

Appendix

The 1283 tax list describes taxpayer's possessions in January/February. Since harvest time, ended at Michaelmas, four months had gone by. Part of the yield already must have been consumed. The winter grains (wheat, maslin, rye and winter barley) must have been sown, the summer grain (barley, dredge, oats, legumes) had not yet. Using the tax list to get an impression of the consumption pattern of cereals and legumes, one can compute the yearly consumption (C) out of the property at the time of the list (P), correcting for seed:

$C = \alpha P$, whereby α is a correction factor.

First this correction factor is calculated. Using Y for yield, $T=Y/10$ for tithe and $S=Y/ys$ for seed, where ys is the yield per seed (gross of tithe), and assuming that no grain was bought, sold or preserved for next years, one can say that $Y = C + T + S$. Assuming that the tax list was held four months after harvest time, then at the time of the list $4/12$ parts of the yearly consumption had already been consumed, so $P = 0.67 C + S$. After some algebra one finds

$$\alpha = \frac{1}{0.67 + \frac{1}{0.9ys - 1}}$$

However Postan's example of Walsham le Willows shows that in this village the sown seed was not counted at first. This leaves open the possibility that this also might have happened unnoticed by the Exchequer in other villages. In such cases $\alpha = 1.50$ should be used as a correction factor for the winter-sown grain instead of the above mentioned formula.

Campbell has calculated the mean yield per seed for demesnes of the county of Norfolk between 1250 and 1349.⁶⁶ Assuming that the values of the adjacent Blackbourne do not differ too much from these figures, these values can be used to calculate the correction factors for the 1283 tax list. These are shown in Table A1.

TABLE A1. Correction factor α , based on yields per seed for Norfolk, 1250–1349

Crop	Yields per seed, Norfolk ^a	Correction factor α	
		winter-sown seed inclusive	winter-sown seed exclusive
Wheat	5.1	1.05	1.50
Rye	3.9	0.94	1.50
Barley	3.6	0.90	0.90
Oats	2.9	0.77	0.77
Peas	2.9	0.77	0.77

^a Source: Bruce M. S. Campbell: *English seigniorial agriculture* (2000), p. 318.

⁶⁵ Stone, 'Consumption of field crops', pp. 19–21.

⁶⁶ Campbell, *English seigniorial agriculture*, p. 318.