Agrarian Diagnosis of South Pembrokeshire – South West Wales (United Kingdom)

General Synthesis

An internship that spanned from March to September 2019

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Greetings:

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I would like to express my heartfelt thanks to every farmer I interviewed in South Pembrokeshire. I received a warm and friendly greeting from the farming community even though I was sometimes coming out of the blue to meet them. The farmers I met made themselves available to me to show me the arcane of how their farms have evolved through time and helped me discover this nice area. Some of them spent time with me even during their heaviest workload which I am very grateful for. We had many enriching talks about Pembrokeshire, Brexit and Wales, culture, and identity. The farming community on the whole (including farming unions, support organism) helped a lot at some stage of the diagnosis. I would like to thank Edward Perkins in particular for his impressive Welsh and Agricultural history knowledge that he shared and for the sheer amount of time he spent with me.

Sophie Devienne (AgroParisTech) and Janet Dwyer (CCRI) my two supervisors were a duet of quality to work with. Janet Dwyer's vast knowledge of UK farming was very reassuring for me. She notably helped me choose and understand my study area that is Pembrokeshire. Sophie Devienne not only made this internship possible but also helped me to carve out the thesis out of my first drafts during the last months. I would like to mention how much time they spent on proofing what I wrote.

Finally I thank the Carasso Foundation for giving me the opportunity to go to Wales to do this agrarian diagnosis.

Abréviations :

AHA: Agriculture Holding Act
BB: Bleues Belges/British Blue
BCS: Beef Conversion Scheme
BF: British Freisian
BFH: British Freisian Holstein
BPS: Basic Payment Scheme
CAP: Common Agricultural Policy
DC: Dairy Cows
DM: Dry Matter
EBS: Mad cow disease
FAT: Full Agricultural Tenancy
FBT: Fixed Business Tenancy
IRG: Italian Ray-Gras
Pbs: Pembrokeshire
PG: Permanent grassland/pasture
PS: Production System
RG: Ray-Gras
SFP: Single Farm Payments
SHT: Shorthorn
T: Ton
TP: Temporary Pasture
UK: United Kingdom

LT: Lenormand Théo

Introduction:

This Agrarian Diagnosis has been funded as part of the "Carasso" project which aim is to assess the impact of the latest EU Common Agricultural Policy in different countries and regions. This project is the result of a partnership between AgroParisTech (Paris) and the CCRI (Countryside and Communities Research Institute, Université du Gloucestershire). South Pembrokeshire is located 150km west of Cardiff at the south-western tip of Wales. This scenic area is well known for its diversity of coastal landscapes and red soil. This work is an attempt at understanding farming systems' evolutions in this landscape and to come up with an acute vision of what is at play from an environmental, economic point of view. This work is the result of a 6 month fieldwork in South Pembrokeshire where I in-depth interviewed 90 farms on their history and today's way of farming.

I. South Pembrokeshire, area studied, landscape analysis:

Pembrokeshire location in the UK and Wales, appendix 1

A. Pembrokeshire a hilly *bocage area* with a North-South soil and climate gradient, typical of South Wales:

South Pembrokeshire (Pbs) is a hilly lowland area under 200m of altitude with a *bocage* landscape (a landscape with fields delimited by tree lined hedges and lots of grasslands). Away from the coast, South Pembrokeshire has a landscape which can seem very homogenous but in fact offers a variety of different potentials depending on the valley size and slope steepness which can be linked to different bedrocks. This diversity allows for a range of typical welsh lowland agricultural productions to take place in Pembrokeshire including; milk, beef, sheep and potatoes. Pbs farming is very much focused on livestock and grassland.

Pembrokeshire climate is affected by the Gulf Stream's oceanic current warm influence, it gets heavy precipitations (>850mm/year) with a good repartition all-year-round (appendix 3). Added to the moderate temperature, this gives an all-year-round grass growth. For example winter corn won't stop its vegetative growth during winter months. Harvesting can be endangered by the very regular rainfall starting mid-august which actually prevents a second hay cut to take place.

The maritime influence can be seen through a precipitation and temperature North-South gradient partly due to the altitude gradient going north. South-Western winds carrying the humid air from the Atlantic Ocean face rising hills from the relief with a discharge in the form of rainfall. The maritime influence (salty winds and temperature buffer) creates a lack of frost starting mid-February south of the Ridgeway.

The area we chose to study (*See map Appendix 2*) showcases this diversity of valleys, climate and productions. It is a 20km long banana-shaped area between Carmarthen Bay and the Eastern Cleddau (Estuary) on an East-West axis. The Northern limit being Narberth or the A40 which represents a climatic, cultural and geographical line (*Landsker Line*), the area then spans across to the sea. We decided not to include Tenby's area as tourism overtook farming as the main economic activity.

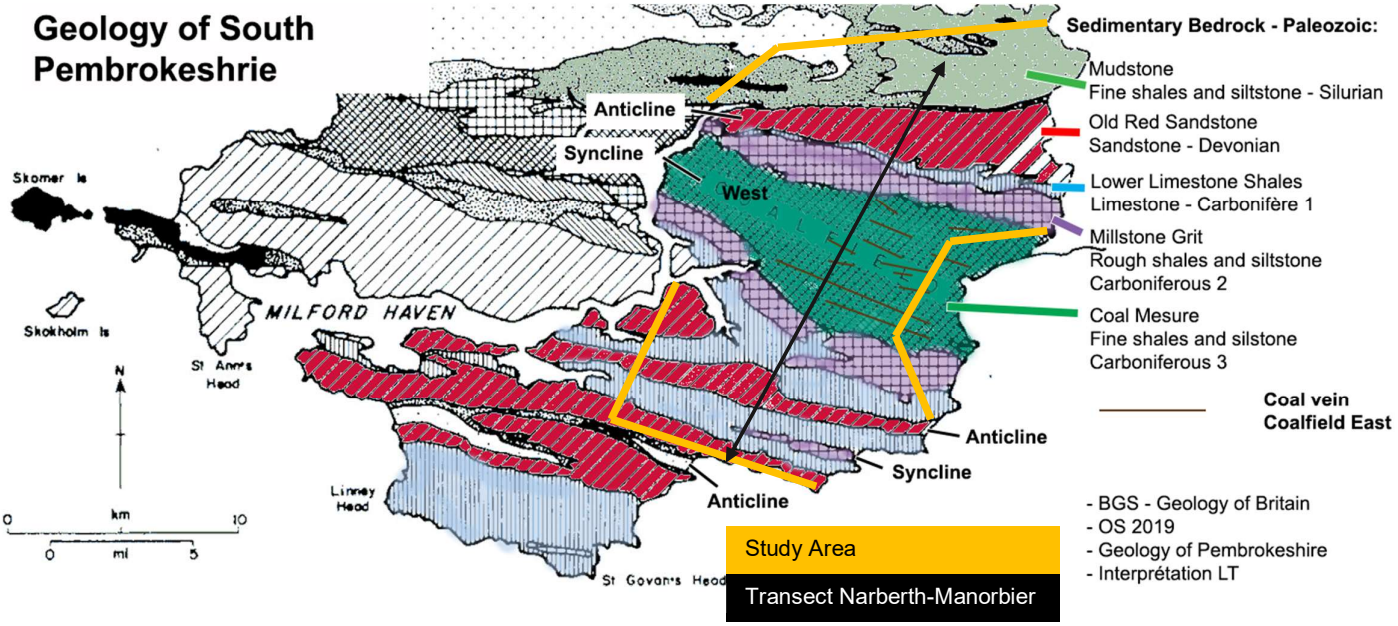


Figure 1 : Carte géologique simplifiée du Pembrokeshire (Geology of Pembrokeshire, Brian S John, Abercastle Publication & LT)

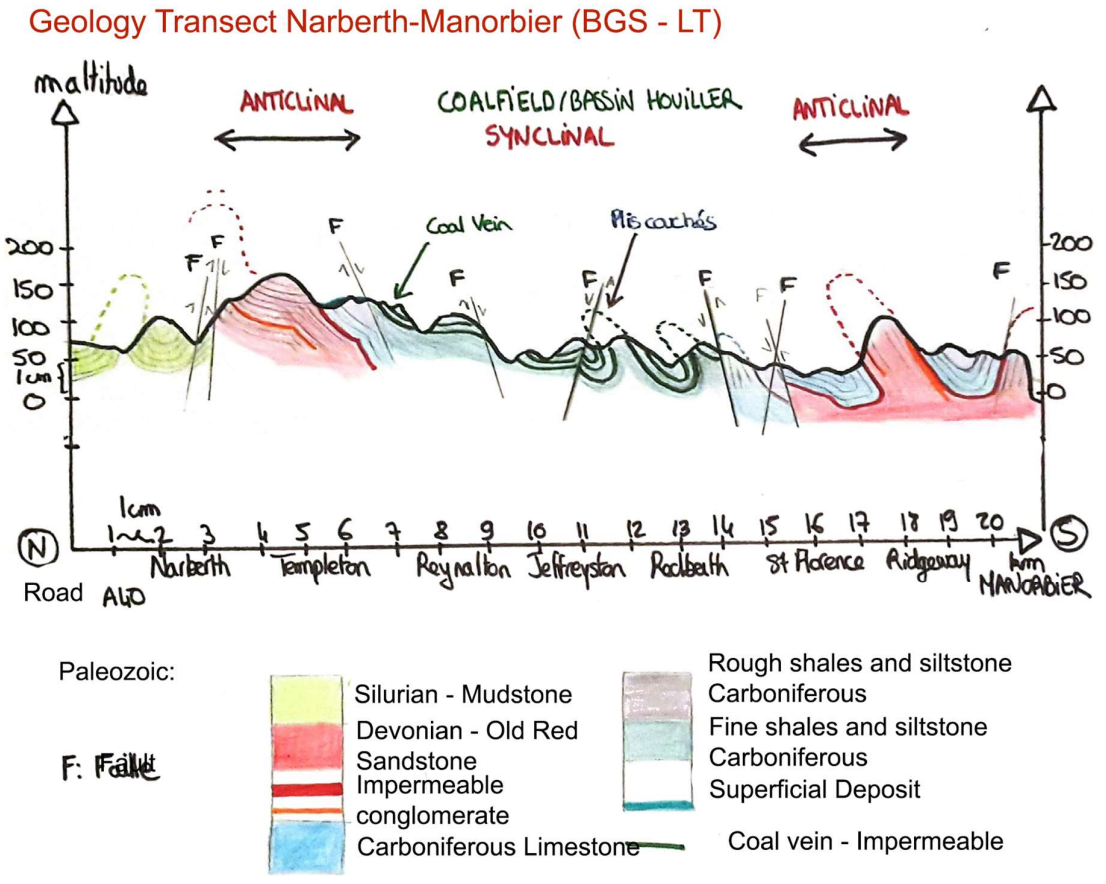


Figure 2: Geology transect from Narberth/A40 to Manorbier, From: BGS carte 228 & 244 Pembroke & Haverfordwest Interpretation and production: LT

B. Geology of Pembrokeshire, the relief can be divided in two valley types:

Cf Fig1 for the map of Pbs Geology bedrock

Pembrokeshire's bedrock is of sedimentary origin, rooted in the Paleozoic (as is much of South Wales). Sedimentary deposits spanned from the Silurian to the Carboniferous periods. The **Old Red Sandstone** were deposited during the Ordovician, forming a hard rock though permeable interspersed impermeable conglomerate veins. Carboniferous deposits form the biggest deposits in our area with the **Millstone grit** composed of soft and rough shales and siltstone, then with soft and rather permeable **Limestone**. These were followed by heavy deposits from the **Coal serie** with mudstones, fine shales and siltstones interspersed with impermeable coal veins, these serie being harder than the Limestone.

This bedrock was compressed, crushed, folded and faulted after diagenesis by the tectonic pressure due to the orogenesis of both the Caledonian and Hercynian cycles. This process gave today's alternating folds with synclines and anticlines on an North-South axis. *Geology Transect Fig2*

The crushed bedrock eroded steadily to a levelled plain landscape through water erosion. After being emerged for a long time, the sea-shore type erosion attacked in a differential way the levelled crushed bedrock again with a gradual retreat from 400m to today's sea level. The softer rocks being eroded faster than the harder. An Appalachian relief appeared the Old Red Sandstone towering above their surroundings eroding slowly compared to other substrates. With the gradual sea retreat plateau levels appeared (*Cf Fig 3:* 1 – 180m, 2-120m, 3-65m) with the harder substrate being over the softer one as well as creating an altitude gradient.

After the sea retreat, the newly created plateau was eroded by the hydrographic network with 2 types of valleys being created: **small**, entrenched valleys where the substrate is impermeable and **wide** valleys where the substrate is permeable. *Cf Fig3*

Pembrokeshire general relief; an hilly area with an Appalachian style relief

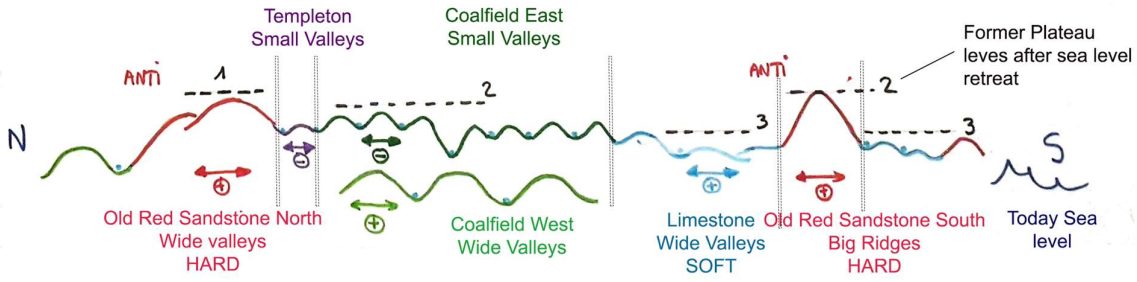


Figure 3: Differential erosion from a levelled plain made an Appalachian relief appear with wide and small valleys (LT from the Landscape fieldwork analysis)

C. Slightly different big ridges types due to different bedrocks with a climate gradient:

Through permeable substrates and until it meets an impermeable strata, the rainwater infiltrates. Water flow doesn't occur on the surface and the river system is not dense, giving rise to wide valleys and ridges with a north to south orientation. The slopes of the valleys are convexo-concavous. *Cf map Appendix 3.*

Wide interfluves cover most of South Pembrokeshire but alteration of different substrates gives variations in the soil's feature. Combined with the climate gradient, it offers the ability to distinguish 3 large spaces in which agrarian systems fit.

1. Big Ridges on the West of the Coalfield: (Cold – North)

Cf Fig4 for general organization – Cf Appendix 5 for a photograph

We notice fine shales and siltstone from the **Coalfied west with their low density of coal veins** (*Cf fig1 geology map*) gave rise to loamy soils with some clay.

On the crest and on the gentle slopes the cold soils though still carrying enough carrying enough allows for a continuous grass growth throughout the year. Ploughing and heavy soil preparation spans from April to October, with soils being saturated from November to March. In this landscape, the land is used split between long-lasting temporary grassland (TG) which can reach a 16 to 17 T of DM/ha yield (>5year) and spring corn (barley) sown in April. But it is also possible to plough in maize, rapeseed or winter corn on gentle slopes. Free-draining soils can be planted with main crop potatoes from April. Early potatoes were sown from mid-March to be harvested in June. Grazing can start as early as mid-March for dairy cows (DC).

In the middle of slopes some permanent grassland (PG) can be found at the outcrop of coal veins which give rise to very clayish soils. The valley itself is wide with deep and heavy soils waterlogged for part of the year, which is very clayish thus impermeable. Permanent grassland can be found there and cattle can graze there from mid-April to October, but DC can't access this area. Sheep can graze there except after lambing.

The potential fodder production on this landscape is high. Grazing management is easy even with big herds thanks to the big size of fields lined with hedges and other fences. This allows for a paddock system to be put together easily.

1. Big Ridges on Old Red Sandstone South: (Cold-North)

Cf Appendix 6 for a photograph

The Old Red Sandstone bedrock in the North of our study area gives rise to loamy soils with a little clay. They are warmer and more carrying than the Coalfield West soils. It is possible to graze with cows from March (not sooner due to the climate) and this until mid-November. Grassland can produce 18T of DM/ha on long term grassland. Soil preparation can begin in March to end in November. Main crop potatoes can be planted from mid-March but early potatoes would be planted 2 weeks earlier.

On this landscape PG are located on the slopes at the outcrop of impermeable conglomerates. These pastures are humid with heavy, deep soils.

2. Big Ridges on Limestone and Old Red Sandstone South: (South-Warm - Dry)

Cf fig 5 for general organization – Cf Appendix 7 & 10,11 for photographs

South of the Coalfield some solitary ridges of old red sandstones tower above limestone ridges and are part of a unique landscape. Farm have access to the red soils and have some land on both substrate types.

On limestone, the slopes are very gentle, the permeable bedrock gave rise to free draining very deep loamy soils with some clay and a good water storage capacity. Humid, permanent pasture appear at the outcrop of impermeable limestone strata. These soils on slopes can be worked the same way as the Old Red Sandstone North soils thanks to the warmer climate and lower rainfall down south.

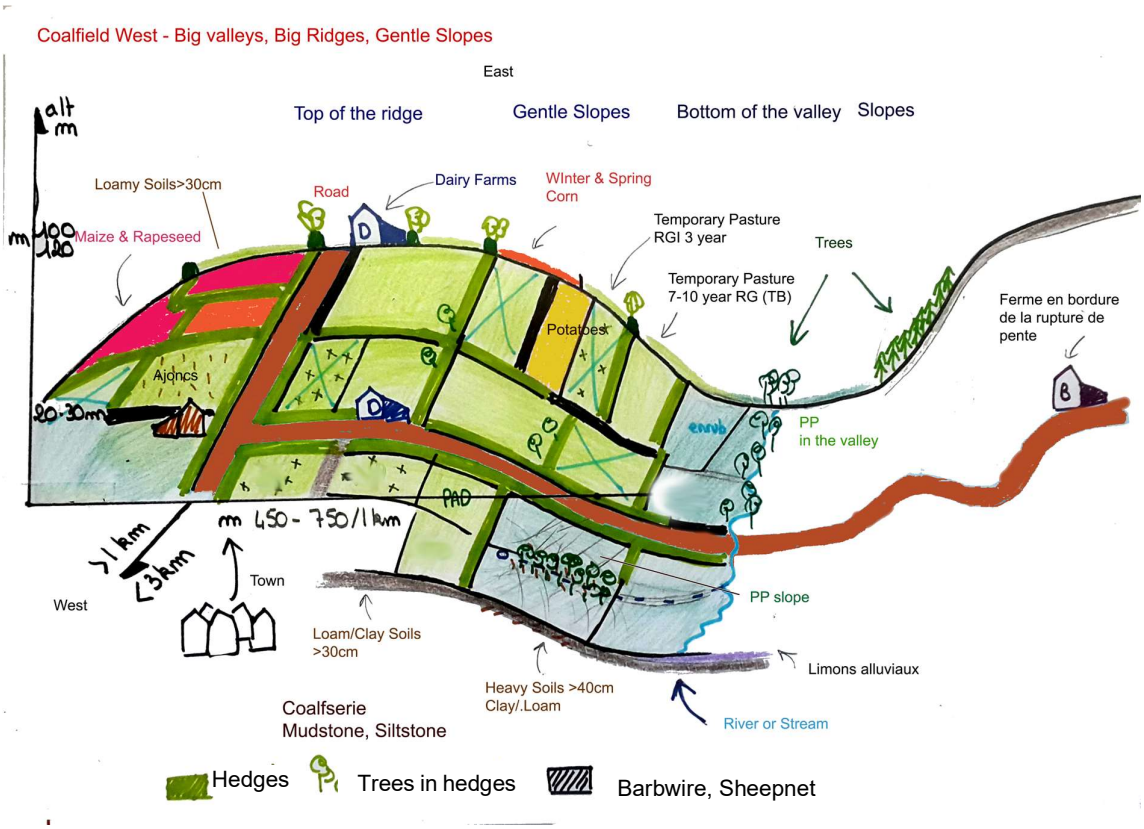


Figure 4 : Typical landscape on the Coalfield West, permanent pasture limits fodder production for farmers (LT from fieldwork)

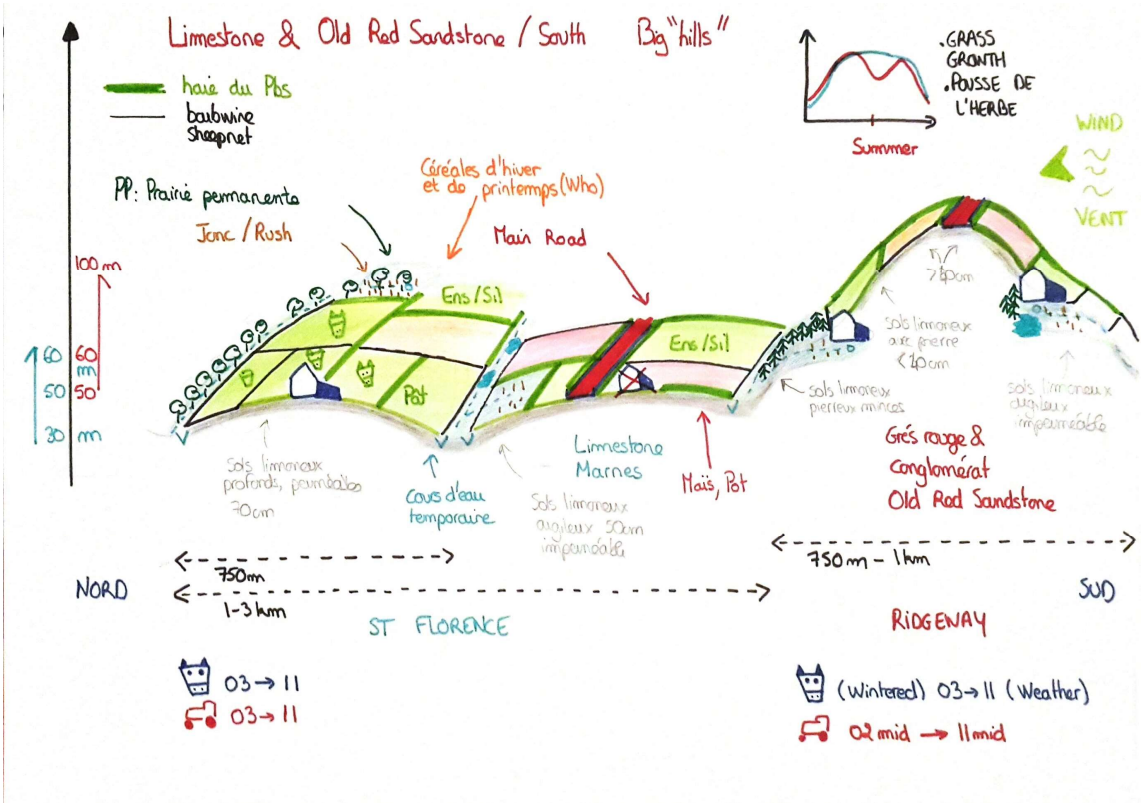


Figure 5: Typical landscape on the landscape unit Old Red Sandstone South – Limestone (LT from fieldwork)

On isolated Old Red Sandstone ridges in the south, soils are thinner and have a higher rock and sand composition than those in the north. These thin soils are facing sea wind action and so they warm up rapidly and don't hold water very well. Grass growth begins early in the spring but slows down during summertime. Field access for heavy machines can be granted all year long and makes it possible to plough in early potatoes from February (sold in May, as soon as the frost melts) or fodder beet. Irrigation ponds exist to irrigate potatoes. DC graze from March to November but suckler cows can be kept outside all year round.

The combination of these two big landscapes sub-units offers farmers a unique combination whereby they do not suffer too much from summer drought which allows an access to unique crops for Pembrokeshire. According to the amount of land on each subunits farmers evolve differently.

A. Small Ridges, less opportunities for farmers:

Cf fig 7 and photographs appendix 8 & 9

East of the Coalfield, the coal veins density is bigger than in the West *(Cf fig1)* and water can't infiltrate the bedrock and will flow at the surface. The hydrographic network is then denser than on other substrates and digs out small entrenched valleys. Substrate alteration gives clayish soils with loam that are impermeable, cold and little carrying. *To localize this unit Cf Appendix 2.*

At the outcrop of the numerous coal veins, humid permanent pasture can be found, they are easily waterlogged through winter and most of spring. They are dedicated to cattle and grazed from mid-April to September. The bottom of the valleys have streams lined with trees. Strong slopes due to a vertical strata fold can be grazed from April. None of these areas can be ploughed up easily.

Small ridges have less clayish soils and water flow will be on the surface with the carrying capacity of these areas allowing for grazing to take place from mid-March to the end of October. The soils are waterlogged for at least 4 days after a rain, and ploughing and other heavy machinery can only access these slopes and ridge from April to the end of August. A long term rotation will be used on these areas with long term TG (15-16 T MS/ha)(>7year) and some spring corn (Barley) (>1/10). Some permanent grasslands can be found (if not ploughed up more than every 10-15 year).

Fields are small and lined by hedges, this limits grazing paddock construction for bigger herds and can be a problem. Farms are located on the edge of the slope.

Around **Ludchurch and Templeton** (south of the Old Red Sandstone North) impermeable glacial deposits gave very similars valley size and landscape potential.

On the small ridges the fodder production potential is much smaller. This is linked to the heavy clayish soils that are difficult to crop as well as the high proportion of permanent humid pasture.

Conclusion Landscape: *Cf Appendix 4 & Fig 6*

There are some stark differences in terms of yield and potential fodder production between landscapes, the small ridges being less interesting landscapes for farmers. It translates as well with a different work calendar and a very different timing in terms of cultural operations.

Finally between big ridges the potential fodder production is slightly different between landscapes but what matter most is when it happens due to the earliness of soils.

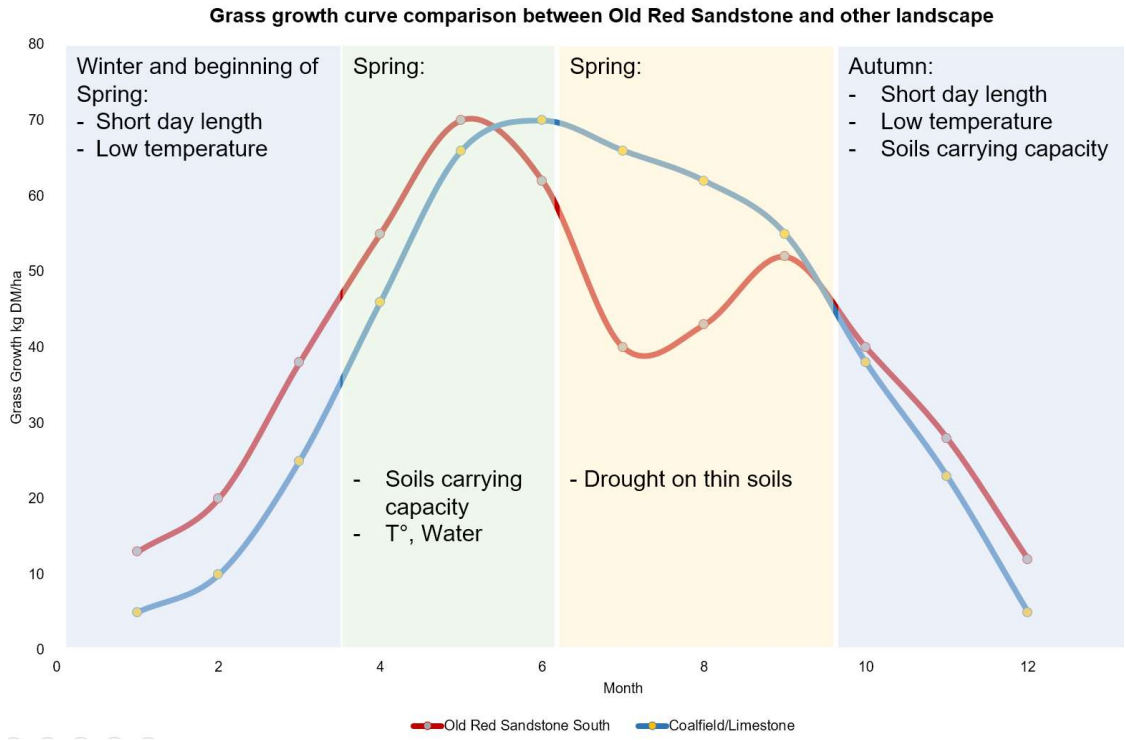


Figure 6: Grass growth in different landscape and limiting factors for grazing. Source: interview with farmers and ADHB grass project, production - LT

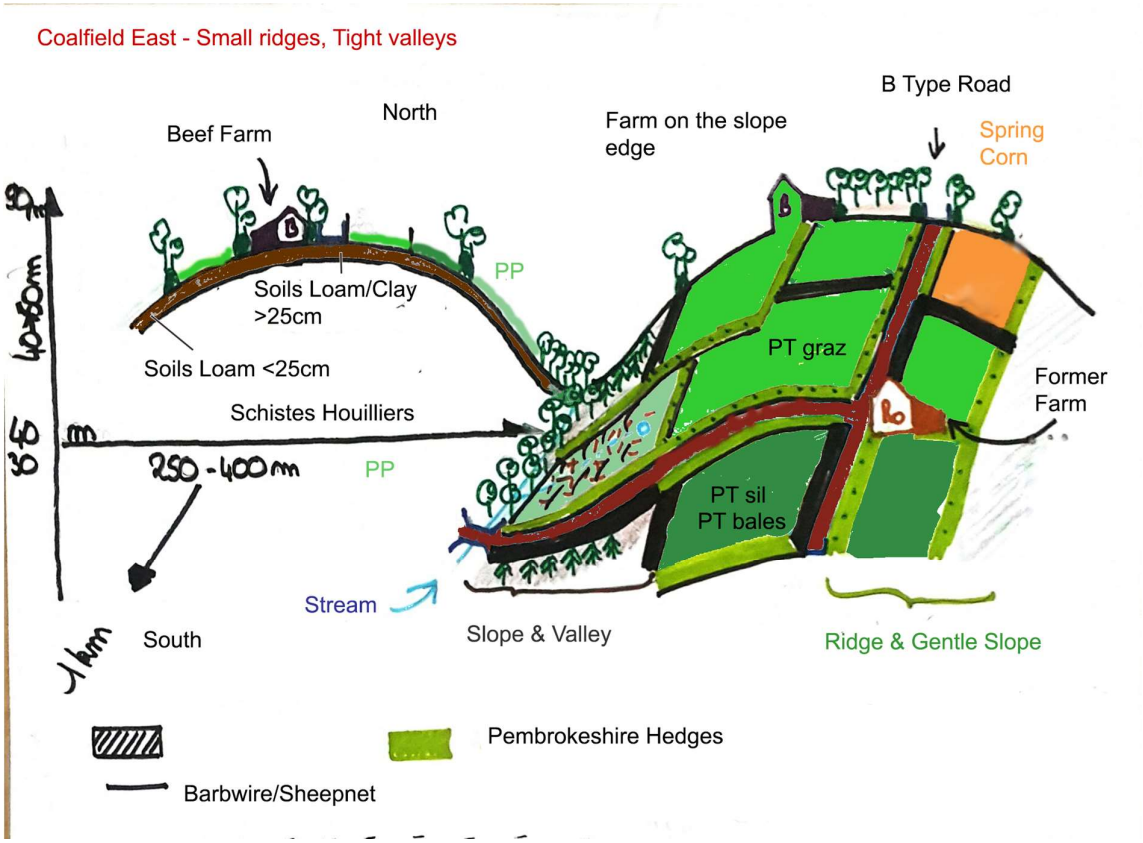


Figure 7: Typical landscape on the East of the Coalfield, small ridges, steeper slopes (LT from fieldwork and interviews)

II. From subsistence farming to market integration, the beginning of the 20th century:

Note: By real prices we mean that we compare deflated price to see how they evolved compared to a same reference amount of money, here the £2017.

A. Subsistence farming facing the free-trade at the end of the 19th century:

After the repeal of the *Corn Laws* in 1846, the UK opened up its border for agricultural products according to the comparative advantage theory (*D. Ricardo & A. Smith*). UK agricultural production were competing with products from USA, Argentina and Canada on their local market. The price of products that could possibly be transported and kept for the long crossing fell from 1870, allowing the UK workforce access to cheap food and to produce industrial goods at a relatively low price. Corn was the number one commodity shipped to the UK and livestock products did not suffer so much from the imports. Milk is a very perishable product therefore this market was protected against foreign imports.

From 1910-1920, most Pbs farms were producing their own food and selling their surpluses. All farms were mixed farms and 90% of them in 1900 belonged to *estates* (Big sized family private domains partly inherited from the feudal structure). Small farms under 25ha relied on dairy cattle (double proposition beef and milk) and beef store cattle, some 20-30 sheep as well as a few acres of corn crop. These three parts represented a third of the farm's value. Farms over 40ha had to have several workers that could be from cottages (with a little land of their own), they kept 10 to 15 DC and kept all their beef calves. They were much more affected by the 1870 agricultural prices downtrend. They all produced 2-3 years old cattle to be sold at stores.

Figure 8: Pembrokeshire mixed farming in the 1900-1920 a diverisity of production with only surpluses being sold (LT)

Pembrokeshire produced store animals ready to be transported and fattened in the Midlands right next to the consumption center. Pbs land was less productive than the one from the Midlands. Fresh milk delivery was only for farmers close to towns and the others had to sell butter, cheese, and cream due to the perishable nature of milk.

With the increase in corned beef consumption, beef prices went down from 1880. Around 1900, ship refrigeration allowed farmers selling butter and cheese surpluses to compete with North American and Australian farms. Farmers sometimes decided to cut down on corn, ploughing being hard and long work.

B. First World War, a respite from free-trade price gloom:

The First World War increased income for most farmers. Food and ploughmen were [again, you need to make sure you are using the correct tense when talking about the past] scarce therefore decreasing output and increasing prices, making it hard to feed the population. Just after the war, agricultural policy is reinstated although it is only in 1920 that food prices decrease after other European countries closed their borders to agricultural goods. Products from foreign farms were imported to the UK. Fresh milk was the only niche market left for farmers to make a revenue in the 1920's, with some farms far from railroads and town being abandoned.

The start of the 20th century is also the sunset of a new tenancy policy. Death duty climbed from 5% in 1900 to 45% in 1920, while inalienability of assets is broken. After the 1st World War facing decline in farm profits, estates begin to sell farms on a large scale, most of all the small ones under 40ha. Farmers buy them back by lending some money in a deflationary context.

III. A new agricultural and economic policy from 1930 which triggers a first development of dairying:

The historic timeline for farms from the 1920-30's is the direct result of the 90 farm interviews carried out in Pembrokeshire. They cover each farms' way of working and evolution through the last 70 years. Interviews go as far back as the 1920's and half of them are thorough enough to describe post-war evolutions.

A. The Milk Marketing Board creation and Early Potatoes help big ridges to get out of the crisis:

1. Marketing Board creation, a new agricultural policy in the UK:

The 1930's offered some opportunities for farmers to climb out of the economic crisis. A new minority Labour government came to power in the 1930's and triggered the creation of new import taxes in 1932 (*Import Duties Act*) on livestock products while the Agricultural Marketing Act was created, allowing for the market regulation of milk, pork, potatoes as well as corn. The Milk Marketing Board offered the same price to every farmer nationally for fresh milk. The demand is sustained by a school milk scheme ensuring farmers the sale of their product.

2. Pembrokeshire Early Potatoes, a remunerating cash crop for farms in big ridges:

In 1930's potato conservation was not well-developed enough cultivate crops to sell from December to June. Farmers on big ridges took up the early potatoes crop as a cash crop and stop producing potatoes for their own consumption. This ridged crop fit well into the farming operations on the farm at this time, as no other weeding needed to take place between February and June. As soon as soils were dry enough to be ploughed in, early potatoes were planted by hand. The planting and harvesting by hand required large numbers of workers to be hired as day-labourers who travelled from industrial towns from the area (Pembroke Dock & Milford Haven). Weeding was the focus of the work that farmhands (family or workers) undertook which allowed farmers to get a remunerating crop with the small yield. Farmers received different prices according to how early they were able to sell their crops. From May to June, farmers would harvest them and get a higher price if the bulk production was not yet on the market.

3. 20th Century Agricultural Revolution starting during the 1930's:

Figure 9: Haystack at the beginning of the 1900 century (Wikimedia commons)

The 20th century agricultural revolution is the one linked with fuel. As farmers get access to money making production, they are able to invest for the tools of this revolution. Farmers can access haybarns to replace haystacks with an easier management and better quality fodder. The bucket vacuum set in new buildings ease the milking chore for the milkmaid while it is now easier to care for higher yielding (4KL) and more cows. As much as 20 or 30 British Freisian replace the 10-15 Shorthorns. A higher milk production can be achieved by buying some cake (corn and soybean). Tractor are arriving slowly for an easier and faster ploughing, this will free ploughmen from their job. More acreage can be turned into fodder crops and corn for a higher food production for the cattle. Mechanized tools from the 19thcentury revolution are being adapted for the tractor. Not using a workhorse anymore allow for some room to be found in stables for more cows or cattle.

Figure 10: Haybarn in Narberth in 2019 (LT)

B. Before the 2nd World War the 20th century agricultural revolution is starting on big ridges:

By offering secured outlets for farms products, this allows people to invest in the new equipment and to develop their dairying activity.

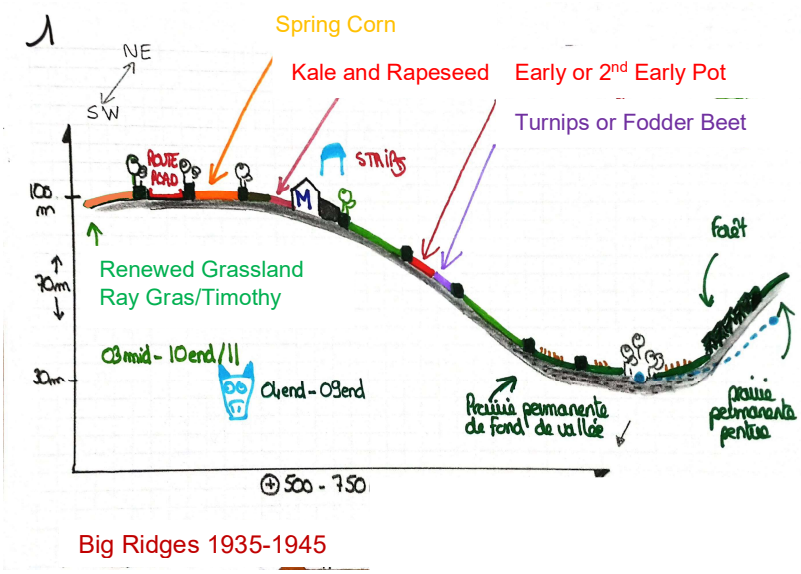
Figure 11 : A vacuum bucket on a farm – Geoff

1. On big ridges the start of the agricultural revolution from 1935:

On big ridges, the slopes were farmed from 1935 with some early potatoes (peaking at 5T/ha), some green crops (kale, mangolds, turnips), some spring corn (either barley or oats at 2,5T/ha) and then some long term Ray-Gras (10 year and more) (at 5 T MS/ha). These grassland were mowed and grazed (rotational grazing at 2 or 3 days). Hay making and its storage in the hay barn as well as other crops harvesting (June-August) while weeding root crops (March-October) made summertime a busy time for farmers. The bottom of the valley is grazed by sheep and cattle. Sheep can use winter grass growth without patching the fields, DC cows are being wintered inside from October until March.

But every day, one of the hardest work was to take care of cows, whether it was to milk them with the bucket vacuum (fuel powered) or to feed them. All the more when that people increased their number of cows. Tractors and motorization freed some space in stables and the time spent at ploughing the land is cut by half. It was then possible to increase the amount of green crops and work intensive root crops to feed the increased number of DC during winter.

On the big ridges mixed farming farms can still be split in two categories in 1930 their size being inherited from the original design by estates.



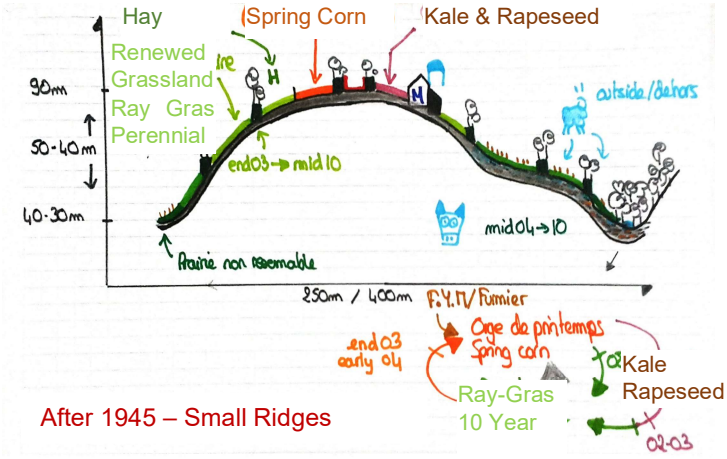
Big Ridges 1935-1945

Family owned farms without employees between 25ha and 40ha cooperate during the summer heavy workload. The adoption of the equipment of the 20th century revolution began after 1940, they will go from 15 DC to 20-25 DC. These farms had 1-2 bacons for self-consumption. A sheep herd of 20-30 Suffolk ewes all outside-lambing in March with a lamb sale at the end of summer. 2 to 5 crossbred veal calves were kept to produce grass-fed store cattle 2.5 years old. Early potatoes occupied a maximum of 1 to 2 ha due to the weeding work.

Rented family farms with employees farm 60ha to 100ha. They combine the use of both types of workers to manage a larger area. These farms planted a large area of early potatoes with 4-5 ha. They did also keep all the calves to bring them to 2.5 years (still as stores) in order to use the permanent valley bottom grasslands. They had 2-3 sows to produce weaners and 100 Suffolk ewes.

The early potatoes provided an additional income to invest, the area cropped was limited by the weeding that had to be done by hand with the farm workforce. The North-South soil and climate gradient means that farmers in the western coal basin can only sell their potato production from mid-June onwards, while those with land on southern red sandstone can access the market from May onwards at more profitable prices. Even without a tractor it was easy for them to work more surface due to the less compact structure of the soil (spreading the workload or allowing for a faster work on the field).

2. On Small Ridges farmers increased their number of cows but without using the agricultural revolution benefits:



After 1945 – Small Ridges

In the coalfield east, the forage production potential was lesser. The more clayish soils are hard to plough. The gentle slope produced most of the fodder with long-lasting TP in Ray-gras (10 years) alternating with spring barley. Kale or Rapeseed (being followed by spring barley) were energy-intensive forage crops and were grazed at the beginning of the grazing season. Hay storage in the haystack and the harvesting of barley represented the heaviest workload. The farmer kept sheep to get the better out of winter grass growth.

Most farms were small, family-owned with 25 to 40ha (2-3 family worker) without employees and had 10 shorthorn DC, the daily milking by hand took a lot of time to do and some casual worker were needed for harvesting and planting workloads in addition to cooperation. They kept 4 calves to raise them.

There were also cottagers, smallholding farmers of 10-15 ha who worked with on other people farm on a part-time basis, applying the same forage production with 2 to 5 Shorthorn dairy cows.

C. After the 2nd World War a new agricultural policy offered secure markets to farmers allowing everyone to soundly adopt the agricultural revolution of the 20th century:

1. The 2nd World War, food scarcity and food security problems trigger a new agricultural policy:

As early as 1939, Germany strained the UK with a U-Boat blockade endangering British food security. Rationing is implemented and food prices increased. The shortage of food was such that it was only in 1954 that the rationing ended. Prices were controlled, guaranteed and farmers had to follow the instructions given by local committees regarding their rotation.

Significant premiums were provided to return permanent grassland (£10/a) deemed suitable for cultivation (e.g. permanent grassland near livestock farms). The war period is also linked to the implementation of systematic milk collection with the rise of the Marketing Boards to control food in the United Kingdom at war and provide it at a reasonable price to the population.

Family farms with employees all had tractors to provide additional production in a constrained labour environment. The *Land Army* (exodus from the city to the countryside to help with agricultural operations) and prisoners of war (POWs) participated in time-consuming cultivation operations.

2. Just after the 2nd World War a new tenancy policy, fertilizers and ray-gras a big evolution:

After the Second World War, market protection policy: guaranteed prices and secure outlets were preserved through the *Agricultural Act*. Food security in the industrial UK required abundant and affordable production for the industrial workforce. The guaranteed price increases were equivalent to the increase of input prices. The tenancy was secured through the Agriculture Holding Act 1948 farmers can obtain a 10-year lease with a review every 3 years of the rent in a concerted manner. The large landowners faced with an ever-increasing death duty and lower profitability disengaged themselves from farming, selling large farms rented to farmers. Tenants now had some power to weigh in the relationship with their landlord and they felt less precarious.

Artificial fertilizers and rotational grazing techniques associated with high-yielding multi-year perennial Ray-Gras on farms allowed yields to skyrocket. Subsidies on agricultural inputs and equipment are granted to generalize motorization and increase the uptake of fertilizers. Above all, farmers use fertilizers on new potatoes, the cash crop to reach a 10-12T/ha yield.

D. From 1945 to 1965 farmers increase tremendously their fodder production per hectare, gains differ according to you location:

1. Farms on small ridges develop their milk production after 1945:

During the war, small ridges farmers ploughed up the permanent grasslands on the crest and gentle slopes to produce more corn despite the heavy workload due to tillage of these heavy soils.

Farmers invested to fully embrace the improved motorization, fertilizers and tools of the 20th century agricultural revolution (haybarn, milking pot). The increase in fodder production (from 5 to 9T MS/ha) and work productivity made it possible to increase the number of DC from 15 Shorthorn to 25 British Friesian with higher milk yields.

Cottagers and family owned farmers both have access to these evolutions thanks to state aid from 1945 to 1954.

2. On big ridges a gain in fodder production and the development of mechanization:

On the Big Ridges during the Second World War, on gentle slopes sugar beet as well as flask linen were grown alongside spring cereals (Barley, Wheat and Oats) and early potatoes with an acreage multiplied by 1,5. The Second World War was a remunerating period on big ridges. And after 1940 fertilizers and motorization were being democratized while high yielding perennial Raygras were introduced (10T DM/ha). The front fence line grazing, rationed by the day was implemented.

Family farmers with employees on big ridges took advantage of these changes to increase their number of DC to 30-35 BF. The early potatoes yields increased with the fertilizers and on the dry Old Red Sandstone South ridges, hills reservoirs were built to start irrigating (total irrigation (combustion engine)). Farmers were gradually buying the land they farmed from the estates on large farms thanks to the early potatoes. The earlier their production was, the faster the buyback took place. The sheep flock doubled to 100 ewes in the same way.

Figure 12 : Motorization with tractors shoved off some workload from early potatoes production. Geoff 1970 (Wales Archive)

Family farmers without employees also benefited from these developments.

On Old Red Sandstone and Limestone, big ridges some mixed farming farmers tried to develop their bovine meat production. On 100 to 120 ha they had a big part of “early land” allowing them to produce a high yielding (irrigated, fertilized) early potatoes crop (may) thus very remunerating. Furthermore just after the 2nd World War the uk meat market was not self-sufficient and price guarantees were uninterruptedly increased from 1945 to 1970 in real terms (and were the only ones).

With motorization it was possible to manage the farm without employees. Stopping the DC allowed farmers to stop producing forage crops, simplifying rotations and crop operations (Hay/Grassland RayGras/Early Potatoes/Spring Corn). The acreage planted in early potatoes doubled from 8ha to 16-20ha thanks to the **arrival of sprays (most notably Blight Spray) reducing the weeding work and disease control.** Only the planting and harvesting, by hand, required casual workers. They specialized as fatteners or suckler-cows farmers. Fattener bought in calves, weaners or yearlings and fattened them up to 36 months with the farm produced fodder (grass, hay, cereals, potato waste...). Loose

Figure 13 : Welsh Black Suckler Cow, Geoff 1969 (Wales Archive)

house buildings were built. 100 young beef cattle were sold every year. Calving for suckler-cows farms took place in April outdoors and the farmer had a new loose housed building to house cattle and suckler cows during winter time. Not having DC alleviated the workload on daily care particularly during the spring. These farmers work with British breeds that value grass well for fattening; Hereford and Welsh Black.

These farms also had a 200 strong march lambing ewe flock. Sheep allow the use of PP and grass growth during the winter.

IV. From 1955 a generalized dairy specialisation in Pembrokeshire with an homogenization of the landscape:

Real price evolution for farmgate price from 1966 to 2017 in Appendix 13, 14, 15. The economic context Appendix 16. Inputs real price evolution Appendix 18. Farms trajectories evolution in the dedicated booklet.

A. Silage and the milking parlours are the main feature of a pack of evolution which revolutionize dairy farming in Pembrokeshire:

Tractors became more powerful (40-45 HP) and had a hydraulic power for square bale machines, towed harvesters or elevators and increase work productivity. It was possible to use artificial insemination (AI) in order not to have a bull and to use selected semen to improve the dairy herd. The BF cows had have a higher milk yield (4-5KL) but required an increase in the quality and quantity of their feed. Without a meat bull it is possible to have good quality cross-bred calves thanks to AI.

Figure 14 : Balemaking from hay - 25kg in 1958 (Geoff, Wales Archive)

Figure 15 : Silage making in Wales in 1960 (Geoff, Wales Archive)

In Pbs frequent rainfalls from August onwards did not offer a window to make a 2nd hay harvest. Silage, is an anaerobic fermentation conditioning technique for low DM mowed grass (25-35%), it allows for an increase in the number of possible harvests by making the grass harvest more reliable (late May, early August) and reduce greatly the workload associated with hay with the forage harvester. This fodder is well valued by the DC. The silage is stored initially in a temporary silo and then in steel framed buildings on concrete for fence rationing of DC. The use of high-yielding multi-year ryegrass varieties (10-12T MS/ha) combined with artificial fertilizers and sprays increases forage production on farms grassland and simplifies rotations by not keeping the fodder crops which needed weeding. Spring corn are still planted to help control weeds and to have a farm-produced energy rich fodder.

To milk a growing number of high-yielding DC with the same amount of manpower, farmers invest in 6 or 8 abreast milking parlour (fig14) with a bulk tank. This makes it possible to collect milk with a tanker truck meanwhile the management of cows on the farm is eased and fluid with cubicles sheds.

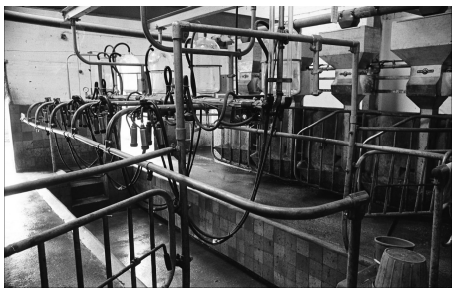


Figure 16: Small herringbone parlour which replaced abreast parlour from 1975 with the rising size of herds. (Geoff, Wales Archive)

From 1975, farmers also had the opportunity to install a herringbone parlour with easier ergonomics for farmers, either a small (5*5) or a large (10*10 or 16*32, single or double equipment) one. New steel framed cubicles buildings are appearing, way cleaner and larger than the kennels used previously. The appearance of drum mowers made it possible to mow the grass in wetter conditions and avoid clogging. For beef production, continental breeds with a higher GMQ than British breeds

and a finishing on muscles start to arrive in the UK, they do very well on silage. Consumer demand is changing with a liking for more muscles rather than marbling.

This specialization leads to the end of mixed farming and other productions that clashed with DC for the use of temporary pasture with a specialization of the workforce on DC and their feeding. The work productivity increases dramatically thanks to the technical evolution with a sharp and sustained decline in the number of agricultural workers from 1950 onwards *Cf appendix 17.*

B. 2 very distinct economic and political context from 1955 to 1980:

1. From 1955 to 1964 a tough economic context out of the 2nd Word War:

From 1955 to 1965, real guaranteed prices fell while input costs steadily increased, thus limiting the amount to be paid by the treasury to farmers as deficiency payments. Real interest rates for loans are positive and relatively high, access to investment is expensive despite some subsidies on input. *See Appendix 7*. Milk specialisation with the net increase in production per worker helps in maintaining agricultural income.

2. From 1964 a pro-investment economic context:

Figure 18: DC eating silage, front fence rationing - 1973 (Geoff, Wales archive)

From 1964 onwards, a paradigm shift appeared during the peak of the Cold War while the British balance of payments is deteriorating. Agriculture, which had increased its productivity better than expected after the war, is seen by the new Labour government as a potential export industry, to be developed. The newly instituted borders control through import taxes on animal products makes it possible to transfer to the consumer the payment of high farmgate price support.

To improve the work productivity of farming, farm development plans were introduced in 1970 subsidies up to 40% on buildings and farm equipment. These plans, including recomposure of fields (amalgamation…) and entrances, modify the landscape with some hedges being knocked down and the extensive use of barbed wire/sheep-netting. In parallel, an early retirement plan is being put in place to allow small cottage farmers to retire. These former agricultural ploughman/workman are freeing up small farms of 15-20 hectares.

In the early 1970s, the UK which was economically stranded before EEC integration, following the 1972 oil crisis, real borrowing rates went negative due to the soaring inflation. Farm input prices were rising very rapidly in real terms, pushing farmers to expand to maintain their income.

➔ **The entry of the UK into the EEC, the adaptation of agricultural policy:**

With the integration into the EEC the UK adapted its agricultural policy to have a fully-fledged supply and demand control integrated into the Marketing Boards. The MMB had to deal with surpluses from the CAP in case of overproduction. Specific butter and powder milk plants were built. The United Kingdom could still modify the pound value used to convert CAP subsidies from the European budget giving some freedom to them.

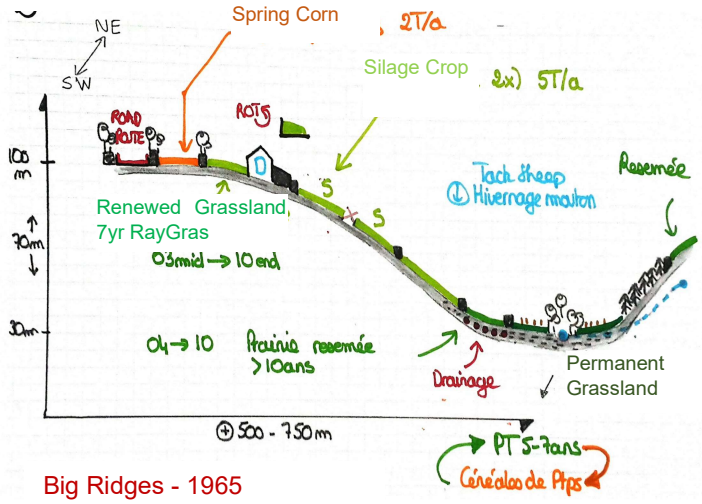
From 1975 onwards, real prices began to stagnate, which accelerated the trend towards dairy specialisation. Investment and early retirement support schemes were maintained. The Sheep Variable Premium Scheme provided direct support to market prices and varied according to the year and export conditions.

The AHA was strengthened again in 1986 with leases that spanned on 3 generations, the lease was even more unattractive for landlords in general. People willing to expand thus needed to buy land.

3. Early Potatoes niche market is getting smaller and less remunerating:

The early potatoes niche market was shrinking rapidly with the improvement of conservation processes (refrigerated storage at 2°C allowing a year-round supply). The time period of remunerative prices becomes very short. This loss of income lead all farmers except those on red sandstones in the south to stop this crop. In parallel, quotas were introduced on potatoes in the UK, preventing an extension of the area cropped by farmers.

C. Homogenization of farming landscape use in Pembrokeshire with the development of dairying:



Big Ridges - 1965

1. The dairy specialization takes place as early as 1955 on big ridges:

The crop rotation were simplified on gentle ridges and slopes. Perennial Ray-Gras is renewed every 5-7 years after a spring corn (barley). TG yields increased to 12-13 T MS/ha. This allowed even more cows to be managed on an equivalent area. The pasture was rationed every 48 hours with a rotational grazing system with a front fence.

Family owned farms with employees were the first to gradually implement these changes. The silo was tried with a single cut before installing the parlour and evolving towards 2 successive cuts. Owning 80 to 100 ha, farmers gradually stopped to produce early potatoes due to their lower price. They quickly attained 40-50 DC with 5 people on the farm in 1960 initially at 4KL/DC before pushing up to 70-80 DC at 5KL in the 1970s for 4 worker. Half of the young calves were kept for up to 24 months.

Because early potatoes were less remunerating, mixed farmers on old red sandstone south and limestone choose to increase the size of their herd with the same acreage by taking up silage, cubicles and making the best of subsidies for investment from 1970 onwards. They did switch to Continental breeds at the same time. Suckler-Cows farmers used the Belgian blues or the Limousines with approximately 60 of them housed on the farm. Fatteners produced 150 beef per year after this evolution. In both cases the cattle produced were 3 years old, beef and heifers ready for slaughter. The high prices supported by direct subsidies made it interesting to increase the sheep herd to 200 Suffolk ewes with an early indoor lambing from January to February. The lamb's ration being topped up with cake it was possible to sell at the beginning of the season (end of April-May-June) for high prices. These farmers had a big workload in the spring with at the same time early potatoes, lambing and eventually calving, they used 1 or 2 casual worker to help them.

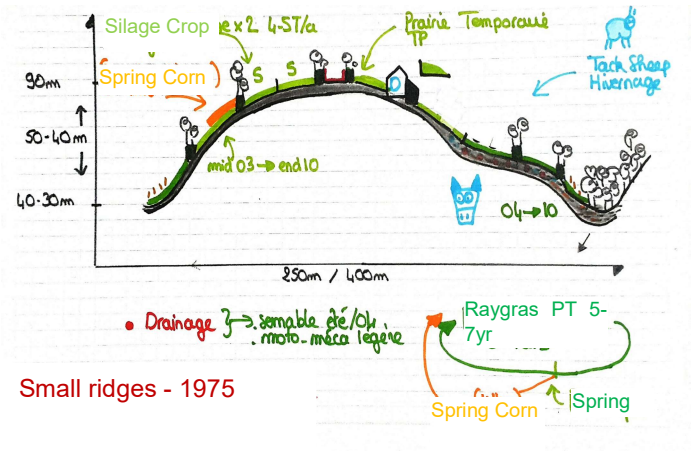
Smaller family owned farms (<60ha) applied these changes *en bloc* from 1965-1970 when investment subsidies were introduced. These farmers made little money from the early potatoes (with less than 3 ha) and had a smaller acreage, less worker and less resilience in terms of forage production. They went up from 20-25 to 50-60 VL on 60ha with 3 people working on the farm.

Motorization and parlours shoved off the workload and reduced the need for workers, cottagers that were assisting bigger farmers are left aside. Their *cottage* with 20 to 25 ha of land was not enough to sustain themselves and they retired with the retirement scheme.

From 1975 onwards, farms development plans were still going strong while farmgate real milk prices stagnated but unlimited outlets triggering farmers to continue expanding. Family farms with employees bumped up their number of dairy cows. Taking advantage of the cottagers' stop, farmers reclaimed land to increase their number of DC to the limit that could be carried by their milking equipment, between 80 and 90 DC with up to 5.5KL/DC. They were building a new, larger cubicle shed and amalgamated their smallest fields while widening all the farm gates. Rented family farms with

employees also invested in a new large-sized herringbone parlour (10*10 or 16*32) from 1980. This allowed them to reach 100 to 120 at DC with the same number of worker by cutting down milking time.

2. From 1970's the dairy specialization takes place on small ridges:



Small ridges - 1975

On small ridges, dairy specialisation was intertwined with an amalgamation of fields, a widening of field gates and most of all a redivision with electric wires or barbed wires to develop an efficient rotational pasture grazing system with paddocks. This was compatible with an increased herd size. The rotation linked to the arrival of silage is in place, but the spring barley area was small, due to the lower proportion of arable land.

Farmers with 25 to 40 ha invested through development plans, in a favorable economic context. They specialized in milk but try to limit capital expenditures by purchasing economical versions of the silage revolution equipment. The milk yield can reach 4.5KL per DC with calving all year round, for each farm managing 40-50 DC. 4 or 5 calves were kept to rear them until 12 months old.

Farmers making these investments just before the introduction of milk quotas cannot fully benefit from the productivity gains.

Figure 19: In 1969 this abreast parlour is an economical version of the one shown previously (Geoff Wales Archive)

D. Milk quotas, Tenancy laws and the economic context reins in dairy farm production to limit CAP milk surpluses:

The European overproduction of milk lead to an explosion in butter and powder milk storage and most of all in CAP expenditure, supply control was reinforced with the introduction of a production quota on milk. Market control mechanisms are maintained for this quantity of milk for each farm. The dairy sector remains organized around the MMB, which has 5 regional offices within which quotas are exchanged. In the UK a market for quotas distinct from land is being set up. Even before it was authorized by the EEC, the annual quota loan was introduced in 1987, allowing greater flexibility for farmers.

At the end of the 1980s, Pbs was a territory specialized in milk, the way the landscape was used was extremely homogeneous throughout the study area and farms operated in a similar way and had nearly the same work productivity. At this time an increase in the size of the farms in our study area was linked to the purchase of production rights, of some land to increase the grazing area for DC and new infrastructure on the farm. The purchase of land is the only way to expand, as the official rental AHA was losing ground due to its rigidity.

Rapidly the UK the UK did not reach its milk quotas (as early as 1987) with a slight decline in milk production.

V. From 1987 a generalized liberalization with a swift differentiation and diversification of farms:

Note: The Agrarian Diagnosis method is trying to link the landscape with the local and global environment's history to explain today's farming system. Today's farming system have been modeled after the technical and economic interviews conducted with 40 to 50 Pembrokeshire farmers.

A. The 1990's a turning point for UK farming, a fast liberalization of milk market, milk quotas and tenancy laws

In 1982 Mr. Thatcher and the neo-liberal conservatives climbed up to Downing Street and inspired the UK economic policy of the past 40 years. Successive trial and error attempts were made on the monetary policy to be retained. But from 1980 to 2008 real interest rates were positive (*Cf Appendix 16*), farmers borrowed in a very constrained environment where investment subsidies were now restricted. Neo-liberals had a negative view of the CAP and of every kind of public support for the agricultural sector.

1. Small farms feel the pressure due to the end of the MMB:

Cf fig 20 & Appendix 18

The MMB monopoly had high collection and processing costs (plants for butter and powder milk constructed for the CAP surpluses management were not operating at full capacity because of the decline in milk production) which affected the price of milk charged to processors. Under pressure from them, in 1994 the MMB was dismantled. The end of the MMB is above all the end of a prize for everyone. The distance to the dairy and the volume produced or the quality of the milk were now part of the pricing equation. Dairy farms over 120DC, which were easier to collect, were collected directly by private processors. They received a milk price 1 to 2 p/L higher than those that remained with the MMB cooperatives.

As quotas became tradable across the UK, geographical areas with access to silage maize invested to increase their milk production. The price of quotas exploded (up to £1 in real value, 50-60p/l in constant value) constraining plans to expand in the areas in the UK where maize couldn't be grown correctly. The regional concentration of milk production increased dramatically with the west of the UK concentrating milk producer.

2. The 1992 CAP, getting ready for market liberalization, a new drive toward a greener policy:

Cf fig 21

The 1992 CAP reform led by J. Major's UK is famous for creating a 2nd pillar in the CAP which focused on environmental and rural development. In Wales it was the beginning of devolution with regional schemes to protect environmental and cultural heritage. Most of all, it was a turning point with the first loosening of the market regulation systems. For example there was a drop in intervention prices for milk, beef and cereals in order to fit in existing WTO regulations. In addition, with the revaluation of the pound sterling from 1995 (2% inflation rule by the BoE), intervention prices after conversion into £ were not activated until they were abolished (*Cf appendix 16*). Export and storage subsidies were abolished.

From 1990-1992 quotas were introduced on SC and ewes to curb the soaring direct subsidies applications and meat production. Like milk quotas, meat production quotas can be sold, but they were split between lowland and least-favored areas (LFA) (in Wales). In 1997 quotas on SC were more or less equal but quotas on sheep production were 4 times cheaper in the lowlands (£8 vs £35).

3. New tenancy forms offer more flexible contract to rent land:

Cf fig 22

With the 1986 Agricultural Holding Act tenancy legislation in place, land leases were not attractive for landlords and farmers were mainly expanding by buying land. In 1996, a consensus between the agricultural unions and the landowners' association led to a new tenancy law created with the FBT: Farm Business Tenancy, which replaced the 3-generation leases and gave back some flexibility and power to the landlord with increased control over rents and evictions. They can concern either farms or

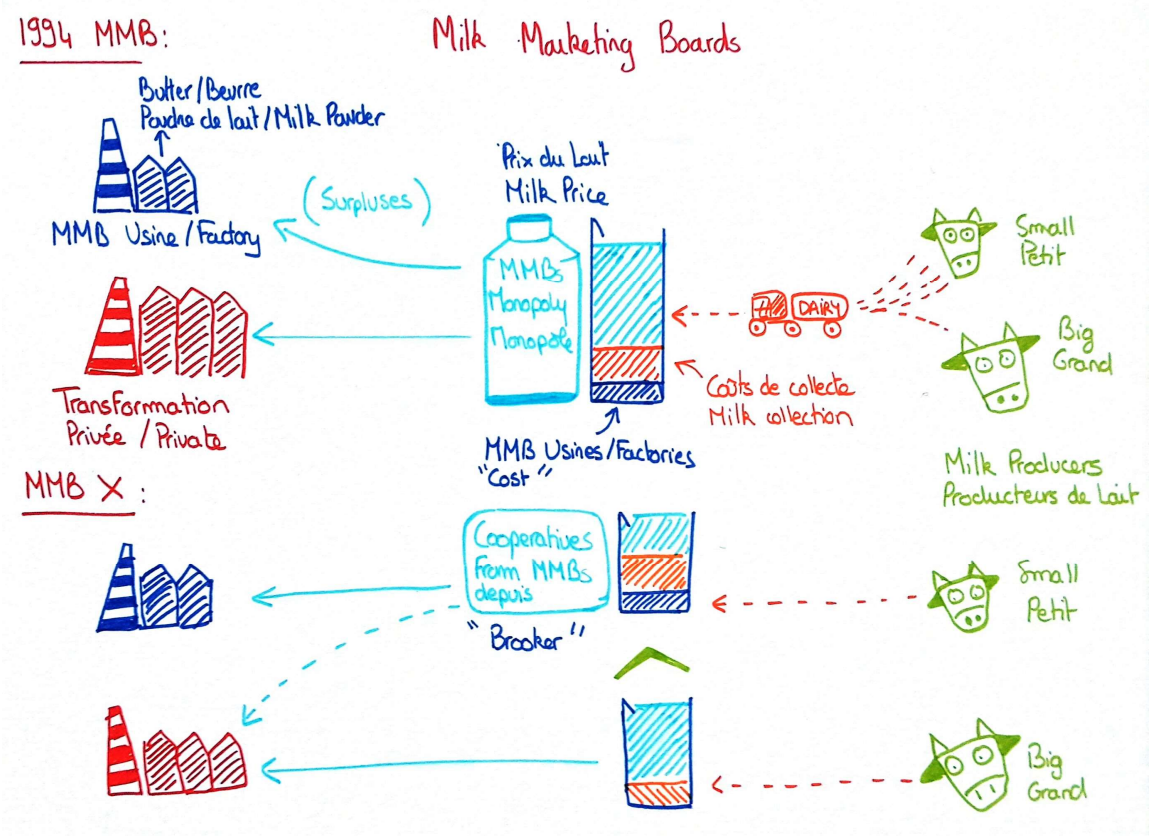


Figure 20 : In 1994 the MMB pressured by the dwindling UK milk production is dismantled giving rise to a new market structure.

Suckler Cow Premium Scheme 1980	Beef Premium Scheme 1974	Variable Sheep premium scheme 1970
(Quota Base 1992)	2 Times at 7 & 12 month	(Quota base 1990) Ewe> 12month and on the farm >100days
Extensification premium < 1,8 LU/ha <1,4 LU/ha <1 LU/ha		
Slaugther premium		

Figure 21: Coupled payments on livestock, suckler cows and sheep farmers benefit hugely from those

Since 1996	Since when? Until when? Length	Breakaway	Control?	Lease price for land in our area?	CAP subsidies back to owner?
Farm Business Tenancy 1995	After 1995 min : 1year max : 15 year	<2year : At the end >2year : At least 1 year before	Land Tribunal	Farm : 100-125£/a Milk : 100-140£/a Other : 70-90£/a	No except agreement
Agricultural Holding Act 1986 (révision de AHA 1948)	Before 1995. Between generation of farmers	At the 3rd Generation		Farm : 80–100£/a	No
Grazing Agreement	Anytime Length : <1yr	At the agreement's end	0	Season : 80-120£/a Pot : 300-350£/a Cut : 70-60£/a	Possible
Handshake Agreement	Anytime Length: Not fixed	At the agreement's end	0	Season : 80-120£/a	Possible

Figure 22: New tenancy forms after 1995

agricultural land and last from 1 up to 15 years. It is also the legalization of the "Grazing License" and

its facilitation, these agreements cover the use of the land for less than a calendar year.

B. A range of technical evolution towards a big increase in work productivity:

The British Freisian Holstein (BFH) breed was gradually introduced and allowed farmers to increase their milk yield per DC to 7-8KL in 1990 but this breed is more demanding in terms of energy density of its feed and requires a complete redesign of all stalls (larger than conventional cubicles sheds). This lead to investments and a change in the use of the environment or cultivated area.

Figure 1 : Silage harvester and 150 Hp tractor with a 12-13 T silage trailer (LT)

Winter corn varieties without vernalization arrived in Pbs for free draining land. **Wholecrop** appeared (corn silage) (10-12 weeks of growth) it is a harvest of unripen corn (winter or spring) to store it in silos or wrapped. The distribution is as easy as grass silage.

The development of low-temperature sum maize varieties allowed it to be used in Pbs. Maize is sown from late April to mid-May (as soon as the field is ploughable) and is harvested from October on the gentle slopes of the big ridges. Maize is at the very edge of the maximum growing area, it is not always ripped in October, but in order to harvest it, soils have to be carrying enough. Harvesting it after the end of October is risky particularly on the coalfield's soil.

Figure 2: Slurry tower, this metal design is particularly useful in waterlogged areas (wikimédia)

These new developments allowed farmers to produce more fodder with at least 30% DM and a higher energy density than grass. This allowed for an increase in milk yield with the same acreage.

Grassland management changed rapidly in Pembrokeshire:

New varieties of high yielding, early Ray-Gras (Italian and early ones) with a very high palatability (high % sugar) permitted an increase of the number of good quality silage cuts (3 or even 4) for silage pit storage (16-18T MS/ha). The cuts made before August are for DC (high sugar content...), the next cuts with a lower digestibility and lower sugar content are for young animals and cattle.

On slury management, operators could now use the "umbilical" spreading system. Pumping manure from the pit or tower to the fields was done via a connected pipe to the tractor spreadplate/dribble bar system. This system is handy to limit the compaction of TP during spreading and to have less nuisance for neighbors (we are in a touristy area) by avoiding using the road. Slurry tankers and muck spreaders can load 10 to 12 T with low-pressure tires.

Figure 3: Slurry spreading with the umbilical system, the compaction is reduced compared to the tanker method. (LT)

On the mechanization side, things evolved really rapidly, every single machine was scaled up allowing for significant gains in term of work productivity, though they also got more expensive (*Cf Appendix 17*). For example forage harvester are now auto-propelled and the hay harvesting equipment is 2,5 to 5 m wide, at the same time tractors and motors grow more powerful to cater for the bigger tools size. The wrapper (or fusion baler) makes producing silage bales easy to make and store. It is easy to handle and it is used on all farms. On the other hand, the wagon mixer is now available to distribute a complete ration, matching the needs of DC with the new fodder variety, though it is not accessible to all farmers.

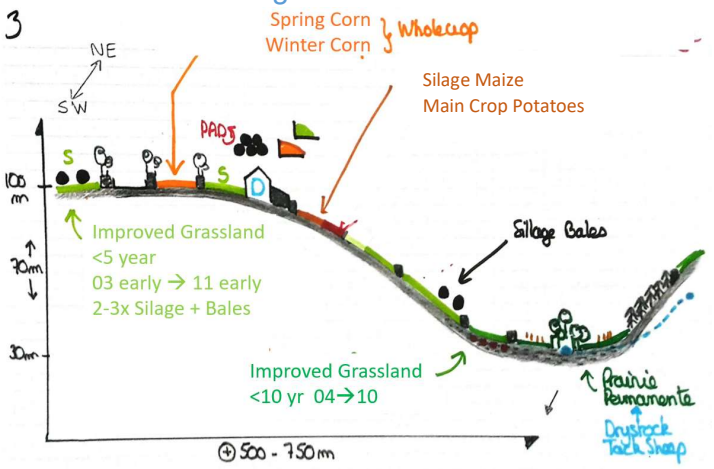
1. Epizootic disease put all the meat sector in trouble in the 1990's:

See Appendix 14 and 15 for prices of farmgate meat livestock production

From 1986 to 1996, 3 major epizootic diseases struck the UK. The mad cow crisis (BSE since 1986), the return of bovine tuberculosis (TB) as well as the foot-and-mouth disease (sheep). Meat consumption declined and caused a lasting drop in prices due to a real loss of consumer confidence in beef and sheep meat. Import bans from the UK blossomed in the EU and other countries. Beef had to be slaughtered before 30 months of age.

MAAF's catastrophic crisis management exacerbated the rise of environmental awareness in the UK. Its replacement by DEFRA (Departement of Environment, Food and Rural Affairs) was a testimony to the decreasing farmer's influence in Whitehall.

C. With the differentiation of farming systems different types of land use arising:

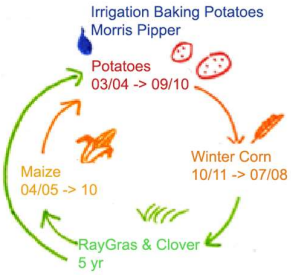


Big Ridges – 1990 → 2019

From 1990 onwards, quotas and the new economic and land tenure context all started a formidable selection among dairy farmers. This was accelerated from 1994 with the decrease in real milk prices and the end of the MMB. **In 1995, quotas on potatoes were lifted with the end of the BPC (British Potato Council)**. But the way farmers were producing early potatoes had not evolved since the 1970s, making it a costly crop in terms of workforce. At the same time tenancy was gaining in flexibility.

Conversions from milk to more extensive beef system allowed family farmers to do without 5 to 10 hectares each year. There was an opportunity to start a production of main crop potatoes. The main crop potatoes are planted in large ridges (30-40 cm apart) from March and are harvested from mid-July to October. A crop rotation longer than 5 years became necessary to control parasitic pressure (nematodes).

Landscape use between different productions systems from the 1990's might have seemed similar but there were huge differences in the production intensity required from the land.



On converted or specialized meat systems, the gentle slopes featured; a temporary high-yielding ray-grass (1 silage crop, 1 bale crop) (10-12T DM/ha) which is renewed at most every 8 to 10 years before renting the land out for main crop potatoes over a growing season and then being sown with winter cereals harvested in wholecrop or as grain (6 T/ha). Grazing is not rationed with a relatively loose rotational grazing every 2 or 3 days.

The remaining dairy systems adopted the new varieties of ray-gras with an increased number of crops (at least 2 silage cuts, 1 bale cut) and 24-hour paddocks. TP last only 5 to 6 years before being ploughed in for Maize (16-17 T DM/ha) or in spring corn and then in winter corn (7 T/ha). The harvest of this crop is mostly silage either on concrete or bales. Numerous farmers try to use corn, but is not systematically used.

1. Small dairy farmers quit dairying and convert to beef:

Small family farmers on large interfluves with 25 to 45 ha and 50-70 DC stop their milk production. If no one in their family was taking up the farm and without clear cut investment plans, they stopped

after 1990. The very expensive quotas and the drop of their milk prices from 1996 onwards triggered them to retire. By selling their milk quotas they could earn from 200,000 to 300,000 €2018.

Elderly farms owner transitioned to beef farming with 40-50 suckler cows into Limousine or Belgian Blue cross-breeds**. Another option is to sell their farm to young farmers** (with another work) who will breed young dairy crossbred cattle producing around 75 animals per year. Farmers use homegrown spring and winter corn to help fatten animals at 30 months. The farm buildings are converted at a lower cost.

Some choose to rent-out their land, particularly near expanding dairy farms. A side-on machine contractor activity can start after the end of the dairy activity if farmers are still young enough. They kick start it with the quota sellout.

2. On big ridges some dairy farm expand in a very difficult environment:

A dairy farm expansion took place in a constrained environment where real interest rates were high with low inflation (*see Appendix 16*)**. Quotas were sky-high priced, which meant a big leap in terms of added value was needed to provide farmers with an income at a time where milk prices were going down** (*see Appendix 18)*. **Farmers specialized their capital and workforce by focusing the farm economic structure on the dairy workshop alone and by handing over crop related operations and tools. The number of dairy cows per worker and the milk yield increase significantly through the increased use of concentrate and wholecrop.**

Large family-run farms with workers (100-140 ha) already had a new herringbone milking equipment and new buildings before the quotas and took advantage of forage productivity gains to reach 200-250VL BFH with 7KL/DC by the late 1990s. They bought back quotas, rent some land and expand their cubicles sheds as well as their parlour.

Family farms with a large family or young people started the quotas period with 100-120 DC on 60 to 80 ha. They put up new buildings, a new herringbone parlour and switched to the BFH by gearing up with fodder production evolutions (mostly wholecrop and the 3 silage cuts). This allowed them to get to 150 DC at 7 to 8KL, farmers leased land to increase their grazing area. The workforce remained exclusively from family. They were now heavily indebted.

Young farmers owned farms were stuck around 70-80VL and had few opportunities to build up the size of their grazing area, they pushed their milking equipment to the maximum of 100-120 DC milked by buying some quotas. 4 hours of milking were required every day with their abreast parlour.

Spring Calving system specialisation, Low Input Low Output:

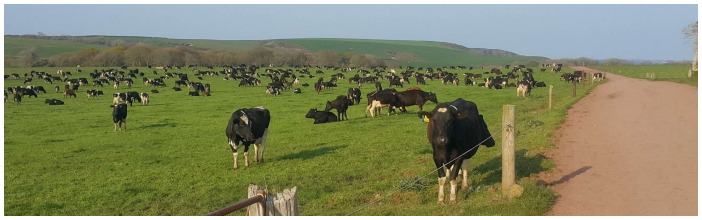


Figure 4: Small low yielding hardy cows and a top notch grazing infrastructure, spring calving specialisation on big ridges. (LT)

Big rented farms with employees on large areas (100-120ha) were moving towards spring calving dairy systems. The lasting drop in milk prices and the shuffling of tenancy agreements with the FBT and regular rent reviews put strong pressure on these farmers. They synchronized the milk production peak with the grass growth curve allowing for a low cost, grass based milk production.

This specialisation can be taken up with limited investments (a cubicle extension and refurbishment of the swing over herringbone parlour). The grazing area is split into 12-hour paddocks for a 300 DC herd at 5.5 KL/VL, it makes for a very intensive grass use from March to mid-November. The grazing infrastructure (paddock and tracks) put in place makes it possible to graze from March to the end of November and the spring calving allows for a net reduction in silage crop because cows are dried up for winter. They use the new grass varieties associated with high fertilizer use (400U/ha/year). Dairy cows therefore have a heavily grass-based ration with between 70% (40-30kg silage - winter) and 80% (55 to 65kg grazed - summer) of the DM.

Converting to a spring calving system meant switching to hardier dairy breeds that produced less milk. Crossbreeding their BFH with small British Friesian meant that they need less fodder while at the same time being compatible with a longer grazing period. Crossbreeding with Jersey makes it possible to maintain the fat and protein content to increase the price paid. The milk yield drops to 5.5KL-6KL limiting the need per DC.

3. Farmers that specialized in beef and lamb production expand:

Farmers who specialized in beef with a high proportion of early lands massively gave up on early potatoes and focused on their beef workshop.

The suckler cow's specialist farmers had to compensate for the drop in prices following BSE and gradually went up from 60 SC to 70 SC and were now hosting 20 store cattle (no quota purchases) from 12 months to 30 months. This increase in production was made possible by increasing the acreage to 140ha-150ha to cater for a faster beef and heifer fattening to 30 months (compared to 36 before BSE). The sheep herd climbed to 300 Suffolk ewes (with a January indoor lambing). These farms didn't employ any workers. This evolution made it possible to limit quota purchases and increased resiliency in the event of another crisis but it mainly worked because lambing and calving were no more competing with early potatoes.

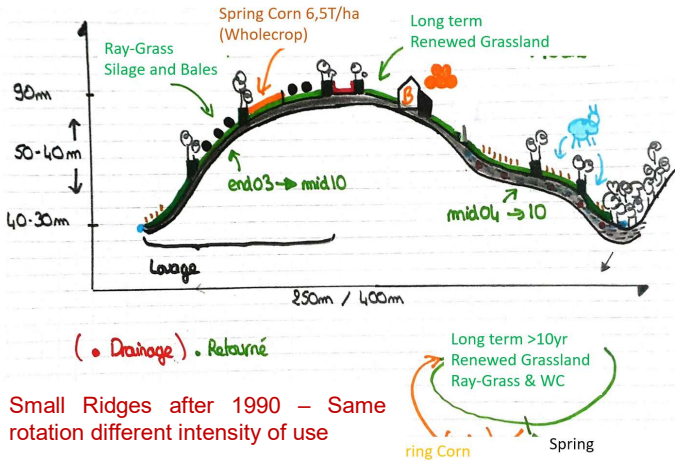
Fatteners processed larger quantities of cattle over a shorter period of time from 24 months (stores) to 30 months. A farm produced 300 beef for slaughter every year. They had a similar sheep herd. They were not affected by quota issues.

4. Puffin produce creation and the return of potatoes in Pembrokeshire landscape:

In 1995 Puffin Produce's cooperative was founded by a group of 13 early potato growers from the county. The goal was to sell potatoes with the size and the ability to control the shipping's with its big cold storage warehouses in order to meet supermarkets demands. It focused on 2 products; small sized *salad potatoes* (<45mm) and *baking potatoes* (>90mm). Main crop potatoes were also produced including Morris Pipper variety, a traditional British variety. Baking potatoes and Morris pipper had to be irrigated.

Some family owned farms specialized in beef and had a large proportion of land on red sandstone in the south went to produce potatoes. They had 120 to 180 ha and shortened their rotation to 7 years (4-5 years of TP) compared to other meat systems. To specialize in potato growing farmers invested heavily in 2 second-hand kits of 2 rows to mechanize planting and harvesting. This allowed them to crop 90 to 100ha of potatoes. Farmers rented in some land each year on big ridges; 20ha to 30ha to other large specialized beef farms and 5 to 8ha to other farmers for a growing season for £300/a (3 times the price of a conventional lease) between March and October. The rented area adds up to the 20-30ha from their own farm. A beef and veal workshop was kept.

D. On small ridges, farmers have less opportunities to make their farm evolve:



Small Ridges after 1990 – Same rotation different intensity of use

On small ridges, rotations on gentle slopes and ridges changed very little. Farmers got access to a third cut with bales and can wholecrop their spring cereals. Heavy soils, even on the top of ridges, did not allow maize or winter corn to be grown as field are not ploughable from September onwards. Potatoes cannot be planted on these clayish soils.

Dairy farmers use the new Ray-Gras varieties (15-16T DM/ha) renewed every 7-8 years and can make 3 cuts (2 silages and 1 wrapping) or more.

Farmers converted to beef renewed the grasslands every 10-12 years (8-10T MS/ha) and made 2 cuts (1 silage 1 wrapping).

1. A first wave of conversion from dairying to beef production:

In a similar fashion to what happened on big ridges, elderly farmers converted to beef. Farming systems evolution and sizes were the same, the key difference being that farmers on small ridges were unable to reach the full fattening of animals. They truncated animal fattening process with breeders, rearer and fatteners with the key beef age being; weaners (5-6month), yearlings (12 months) or strong stores (24 months) always mainly fed with grass. Some people fatten their beef cattle and keep growing some spring barley to feed it though their LWG is lower than people on big ridges.

2. Some dairy farmers expand on small ridges during high quotas price:

With many farmers retiring some were able to take on more land. Some family farmers were still limited by the size of their grazing block (if the reclaimed land is remote or in other narrow valleys) or their milking equipment (abreast parlour). They cap at 100-120 DC with yields of 6-6,5 KL/DC. They are often working the farm with 2 to 3 family people, some at least 20 years from retirement. Farmers with large families (3-4 family members, with young farmers) are adopting the full herringbone parlour package and will increase from 120 to 250 DC and doubled their area to 160ha for yields of 8 KL.

To make the most of the work productivity gains due to the new equipment, farmers use contractors for all work in the fields except for part of the manure spreading and grassland management to concentrate workers and capital investment on dairy cows. The increase in size is phased on dairy farms, while fodder production gains make it possible to re-establish a store cattle production workshop as a transitional measure to invest in quotas. Any expansion during this time is paid with very high interest rates that have a strong impact on further developments in the 2000's.

VI. The end of quotas and the 21st century agricultural revolution offer new opportunities for farms:

Milk price evolution from 1984 to 2017 Appendix 19, bovine and ovine meat price see appendix 14 and 15. Economic context appendix 16.

From history interview about the last 30 years and with technical and economic interview (60 from the 90) it has been possible to build an archetypical farming landscape for Pembrokeshire and to understand how each of the 30 designed archetype appeared. The archetypes named production system are themselves a typical combination of different cropping and livestock systems (managements) working with the same kind of resource (workforce, investment, land, landscape). See specific booklet to follow their apparition in the landscape.

A. A highly competitive industry context on milk keeps price down while new technologies allow for an increased number of cows per worker and a controlled consumption of inputs:

1. Devolution, decoupling and flat rate; CAP evolutions from 2003 to 2020:

Unlike England, Wales's based CAP decoupled aid on historical references. This in order not to harm farmers in the Uplands who were relying heavily on subsidies. From 2014, wales progressively went toward a flat rate payment. In 5 years the subsidy per hectare was homogenized throughout Wales. The first 54 hectares were valued two times through redistribution. To access the SFP (Single Farm Payment) (DPB), farmers must meet the Cross Compliance or GAEC (Good Agri Environnemental Condition) criteria's.

Farmers in the Lowlands have seen their subsidies payments decrease (upland farmers have access to very large areas so the payment stayed the same). A sharp decrease for specialized dairy, beef and sheep farms that had optimized their farming systems in the early 1990s to get the most of the subsidy system. Other farmers were less affected by this CAP reform. All of them now receive 225€/ha for the first 54 ha and 120€/ha for the rest of their acreage in 2018.

2. A depressed economic context with low milk prices:

See Appendix 19, 20 & Appendix 16

From 2000 onwards, a trend change began, with the UK no longer reaching its milk quota, quotas gradually lost value and deflated relative prices got reversed between milk and quotas. But, from 1999 to 2008 the farmgate price for milk were lower than those paid since 1966. At the same time in the UK real interest rates were positive and really high, making any investment heavy in terms of debt and interest repayment while access to investment subsidies was limited. From 2008 onwards, milk prices rose again with the full liberalization of the milk market.

Dairies started to set up specific spring and autumn calving contracts to try to flatten the milk production curve throughout the year with an extremely tough bonus-malus system. Quotas disappeared in 2014 but from 2008 in the UK they no longer had any market value. 2008 also marks the beginning of the economic crisis with real borrowing rates plummeting to negative values allowing for an easier access to capital investment. 2 hard dairy crises hit the dairy market in 2010 and 2016 (after the end of quotas at European level, a generalized overproduction happened in every European dairy area).

For beef and sheep meat, the early 2000s were a time of stagnation. It is only from 2008 onwards that real prices started to rise again, with consumption in emerging countries pushing up prices. On beef a bonus can now be obtained with British breeds including the Hereford with a search for quality marbled meat.

Agricultural inputs real prices started to skyrocket from 2005 particularly oil prices. The soybean a key cake component went up at the same time. Costs in real price were increasing faster than farmgate prices. *See Appendix 18*

3. The 2nd pillar of the Welsh CAP; agro-environmental schemes:

Wales has been fully in charge of the CAP's 2nd pillar since 2003, Tir Goval is a point based agri-environmental scheme. A management plan focused on the preservation and restoration of the environmental and landscape heritage is drawn up for every farm. More interesting for farmers were the subsidies to maintain and replant hedges. For example sponsoring the renovation and installation of fences or cowtracks. These were important changes from a landscape evolution point of view. From 2003 Wales introduced organic subsidies (conversion and maintenance) continued under the 2014 CAP. This made some farmers to seek higher prices via organic products.

Tir Goval was terminated in 2013 and GlasTir kicked in, bringing together all the environmental measures existing in Wales. Based on a point system with different levels of engagement. The actions are basically the same as before but payments were reduced and the point system blocked access to any farmer with temporary grasslands and a high livestock density, unless cultural or environmental heritage elements can be found on the farm.

The 1993 Nitrate Directive is effectively applied to all surface waters in 2004 in the UK. A first manure management plan is then put together and is binding for dairy farmers with cows in cubicles sheds. Gradually, farmers must manage all their effluents and every rainwater runoff. Investment grants (40%) for compliance are linked to investments accessible to farmers owned farm or larger than 100DC with a minimum investment limit of £100K in a constrained investment context. Pembrokeshire is not integrated into the NVZ (Nitrate Vulnerable Zone).

4. The *Tuberculosis Bovine* settles for the long term in Pembrokeshire with a net shift in culling rate:

Dairy systems are strained with the current outbreak of Tuberculosis Bovine, the reimbursement mechanism has farmers to produce their own replacements to prepare for any eventuality. A positive TB test can lead to the slaughter of all or part of the herd and prevent the sale of any cattle without an extremely restrictive authorization system.

A dairy farm registered as infected with TB has an annual culling rate of 10 to 15% higher than normal. The replacement heifers number must therefore be increased, farmers have less spare forage. On affected dairy farms, stock density is therefore increasing.

With the TB outbreak, farmers face a reduced animal mobility authorization. Storecattle workshops are at risk. Especially if the farm is stretched on forage resources. Storecattle producers tend to reduce their loads to have some spare forage if there was a quarantine.

5. The 21st century farming revolution increase work productivity:

With IT, new opportunities were opening up for farmers to access new forage and work productivity gains. To milk cows the newest options range from the robot parlour to the rotary parlour from 2005 onwards (both are very expensive to set up and maintain), to a simple renovation of existing parlours with automatic cake bins, automatic cluster removal and automatic cluster cleaning. Animal management can then be automated with automatic sorting gates on large farms over 500 animals. Farmers can now operate in complete ration with the towed wagon mixer or independent automated cake bins.

Genetics made it possible to work with sexed semen with a good success rate to reduce the quantity of male dairy calves and to compensate for the increased culling rate with TB.

Grassland management on dairy farms now uses satellite data to monitor grass growth, and tests for nutrients levels. The rotational grazing will be rationed every 12 hours on dairy farms with a paddock system combined with a grazing infrastructure if necessary.

The **GPS guidance** of tractors and machinery allowed for a refined management of the fertilizer and spray use. The use of fertilizers in the form of liquid N or injection came down to a better management of nitrogen runoffs.

B. Some farmers have to increase the size of their herd to keep having an agricultural revenue:

Figure 21: 50 points rotary parlour and DC from Netherlands, Ireland or Danish, a fast expansion. (Wikimedia)

Family-owned farms that expanded at a very high cost during the high quota prices in 1990, based on either small or big ridges faced a challenge in a very low milk price environment: At the beginning of 2000 with 250 DC BFH at 8KL they were facing hefty loan repayment while milk prices stagnated at a very low level and in 2005, input prices increased very quickly. To solve this problem of input/output price squeeze, pay their loan and get an agricultural revenue, they choose to dilute their investments in a maximized raw product by increasing the milk production.

The first step consisted in a massive investment in buildings (slurry pit, cubicle sheds) and in the milking parlour with a 50 point rotary parlour (plus the ice cube cooled milk tank) to double the herd size. Farmers also bought BFH DC abroad and rented (2/3)/bought land (1/3) to keep 0.5-0.6 ha/DC and spread on every landscape of the study area. They fully specialized their capital investment on the farm. These farmers were significantly increasing the size of their dairy farms by moving towards a business approach, with a massive, continuous investment being made over 10 years with loans for around €3 million 2018 (or €300 thousand 2018 yearly payment). Under these terms and with workers and rents to pay, farmers have sought to maximize milk production per DC even more with yields toping at 9 KL as early as 2010. 2007 with the EU membership of Eastern European countries brought in young and cheap labour to British farmers facing a generation renewal challenge among herdmen.

Business leaders choose to take up the entire digital and genetic agricultural revolution, including the switch to sexed semen and the management of the herd in 3 yield groups with a differentiated feed ration. On small ridges, farmers must stop grazing from 450 DC due to the size of the grazing block accessible on this smaller crests. On the other hand, on big ridges, it is possible to graze a herd bigger than 500 DC on big ridges and gentle slopes.

From 2010 onwards, the fall in milk prices in a context of generalized inputs price increases had these farmers to seek bigger economies of scale with a second growth and investment step. Farmers then had to get back to do some cultivation operations to ease the workload on the contractors with whom they work; fertilizer application, ploughing or tedding all with GPS guidance assistance. Trying to get more land applies a lot of pressure on farm land prices.

On small ridges, with cows inside all year round Production System 3c (PS) and its 1000 DC BFH (550ha) can reach yields of 10.5 KL/DC with 3 milking per day. Their feed ration is based on grass (20-25% in MS) but incorporates ¼ of corn silage and ¼ of self-produced wholecrop to add energy dense fodder. The rest of the ration is based on bought in cake. These business managers use 13 employees working in 3*8h to milk, clean and feed cows.

On big ridges the PS3b with 750 DC that graze for a yield of 9.5KL and this with only 6 workers. The entire workforce and acreage is dedicated to the milk production of the BFH flying herd (meaning it is not breeding its own replacement but buying them…). This helps to limit the workload. The complete ration assisted by an automated cake distributor is based at 60% on grass silage and ¼ on spring barley wholecrop with a ration modulation according to the yield category. The grazing of this important herd is managed on 100ha split in 12h paddocks.

C. Some farmers retire and either sell or rent-out their land:

Many farmers reached retirement age between 2000 and today (60-70 years old, health problems...) and stopped farming, once and for all. Farmers that owned their farm are now renting out their land to other farmers while still trying to get back subsidies.

The Rent-Out Farmers category, represented by PS7a, 7b and 7c, provides expanding dairy farms with the agricultural land they need for forage production. Whatever the rental terms (FBT or Grazing License), the return of CAP subsidies can be unofficially integrated into the agreement.

Land prices and rental prices are driven upwards; the growth of tourism in Pembrokeshire, urban sprawl, and the need for pre-retired farmers renting their land to earn an income explain this evolution. Decoupled land-based subsidies reinforce this price increase. In 2000 1 acre was worth £3000, in 2017 1 acre could reach £6000-7000 on big ridges.

D. On big ridges a swift diversification move for farms:

1. From 2000 a general trend for dairy farm expansion:

On big ridges, there were no real changes in the use of the landscape. Silage TP yields can now reach 18 T DM/ha.

Rented family farmers with employees who had taken the lead at the beginning of the quotas continue to increase their size to maintain their income. Their number of DC increases from 250 to 300/350 with milk yields of 8 KL. Land management changed really little, grazing is now rationed every 12 hours as the herd size increases. They expanded by renting in land on different landscapes to feed the expanding dairy herd. In 2005, they reached 250 ha. Their 1990's investments was laying heavily on the farm profitability.

Family owned farms on big ridges with young farmers who pushed their milking equipment up to 120DC by renting in some land invested and bulk adopted the technical evolutions from the 1990s; the swing-over large herringbone parlour, new cubicles, a slurry pit able to cater for 150DC... They are getting in line with the large families on big ridges who had invested during the quotas and had become heavily indebted, they can only with difficulty continue to increase their number of DC.

The differentiation of agrarian systems will be based on the type of land and the location of the land associated with the expansion.

Some of these young owner with 150ha and 150VL on big ridges converted to organic farming from 2001. This movement is linked to the creation of the local organic dairy farmers' cooperative, *Calon Wen*, but above all to the interesting subsidies coming with conversion plans. The transition to organic farming also required them to take in more land to reach 200 hectares next to their existing acreage. With limited investments in land purchase and the establishment of grazing infrastructure, it is possible to seek protection from dairy market fluctuations under the organic scheme hood.

They crossbred their DC with Jersey and SHT to sustain high protein and butterfat levels with a good hygiene quality but lower yields. The grass is rationed through 12-hour paddocks and the winter ration is completed with wholecrop to reach 7KL. These farms returns to a 1945 rotation logic with fodder crops, 3 workers are sufficient to manage this farm. At the end of summer, when grass growth slows down, cows graze on forage turnips. The spreading of manure from laying hens made it possible to maintain a high level of forage production at around 8 or 9 T DM/ha on grassland.

With the increase in real input prices from 2005 onwards, farmers with an organic certification were seeking to increase their number of DC by extending their acreage to 250 ha to accommodate 200 DC.

2. From 2008 dairy farms over 150 dairy cows tend to specialize:

From 2008, the real price of milk faced significant variations with the end of market regulation measures linked to the CAP. Farmers are seeking to increase their resilience to these fluctuations. Milk prices remained well below the 1970-1990 average in real terms, but investment conditions are favorable.

➔ Autumn Calving specialisation PS2b :

The autumn calving specialisation can be linked to specific contracts and the annual rise in milk price from July. It allowed family owned farms who have succeeded in expanding but with not much land available to top up their grazing platform to expand over 150DC. Their limited grazing area is split in 12-hour paddocks but cannot accommodate more than 180DC (All year round calving)(30-40ha). Farmers invested in new cubicles sheds and refurbished the milking parlour. The percentage of permanent wet or sloppy acreage is higher than on farms specializing in spring calving.

With the autumn calving specialisation, calving takes place over 3 to 4 months from July. The high yields of 7.5KL to 8KL require high quality winter forage. The 3 to 4 silage crops are important but

to reduce their reliance on concentrates, autumn calvers tend to use more energy dense forages to reach 8KL (maize or winter cereals (wholecrop or not)).

(**PS2b**) In 2010 these income-generating farms expanded and eventually invested in a one man rotary parlour to manage 300DC without additional workers thanks to the 21st century agricultural revolution. Maize and winter cereals increased use in the ration mean that the milk yield goes up to 9000L and they now work with a wagon mixer. The grazing platform being the limiting factor at the time of peak production (September) (still 30 to 40 ha) DC grazing will be topped up with grass silage after calving. For 7, 5 months farmers will keep the silage pit open to feed his herd. The acreage has grown from 150 to 200 hectares.

➔ **All year round calvers increased their cow number and use different fodder types PS10a, 10b:**

Family farms with a large number of family worker (4-5) that made a significant jump in investment in the 2000s to 150VL increased the size of their livestock to 200-250DC. Since 2015, these producers with a leveled milk profile have been receiving an additional 1 to 2 p/l as part of the Tesco Cheese contract at First Milk Dairy, which allows them to generate a better income. They invested in buildings and land to top up their acreage at 120-150ha. With the constrained milk prices the high yield around 8KL is allowing them to pay for the expansion while ensuring a sufficient revenue. Grazing platform is split in 24hour paddocks, it constitutes the limiting factor to increase in the number of DC. With 40 to 50 ha available, farmers are less constrained than autumn calvers. To keep all the family members occupied, they can add a light storecattle workshop (up to 18-24 months) with crossbred calves.

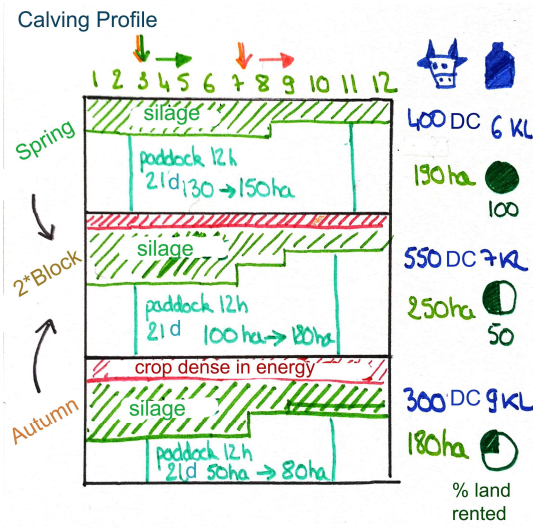


Figure 22: Different land use profile for different dairy calving specialist

➔ **21st Century revolution on smaller farms PS6b:**

Dairy farmers around 200 DC make up the vast majority of today's Pembrokeshire dairy farms.

Spring calving farmers that rent their land (PS1a) are adopting the digital revolution that allows them to follow the growth of grass and nutrient levels in their plots and thus have a differentiated, more input efficient management. Their number of dairy cows increases to 400-500DC with an improved grazing infrastructure and 12-hour paddocks, 3.5 workers are enough to manage the farm and all the cows.

Some spring calving farmers that own their farm will convert to double block calving herd (aut, spring) in order to balance their milk price profile, increasing their number of DC to 550, and their yield to 7kl but without increasing the grazing plaftorm area and by building a one man rotary parlour to make a leap in work productivity and make the most of their acreage. It's the PS3c.

3. Family farms around 90 to 120 dairy cows which did not expand differentiate wildly:

In the early 2000s, family owned farms with young farmers and 90 to 120 DC and an abreast parlour are the smallest dairy farms remaining on big ridges. Still milking BF with milk yields of around 6KL they were struggling with both the unfavorable investment context and very low real milk prices. The end of the MMB gave them a lower price than other farms. Farmers who did not retire and who had difficulty maintaining an income with the CAP evolution will invest. Farmers who were on the verge of retirement get out of dairying, those aged around 40-50 years old tend to convert to organic farming.

➔ **Looking for an increased raw product through organic farming conversion PS6b:**

On big ridges with the FBTs some farmers managed to get some land close to their farmstead to form a grazing block of up to 70 ha. This made it possible to manage the decline in forage production from organic land. Summer calving is a way to avoid low spring prices (even on organic milk 30p/l vs 43p/l). This makes it possible to have enough with a 40ha grazing block. Shorthorns are rustic DC with lower

energy requirements and a good milk recovery capacity after wintering (spring). Rationing of pasture goes from 24 hours to 48 hours. It is a limited-cost adaptation of production equipment. The abreast parlour is refurbished with the installation of automatic cluster removal and automatic cake bins.

The rotation is very similar to the one from the 1940's. Making sure you have enough forage for winter is a key point for a summer calving system, 7ha of Wholecrop spring barley and peas provide an energy component to top up the grass silage. Kale provides a forage resource to be grazed in early spring. Temporary grasslands have a higher proportion of white clover and 10ha are even in red clover. The TP are renewed regularly, particularly to control weeds.

Some dairy farms made a leap in work productivity with heavy investments when interest rates dropped down in 2008.

➔ **A latter, smaller family owned spring calving specialisation PS1b:**

These farmers invested in a new 10*20 swing-over herringbone parlour and bought land to expand their grazing platform (paddock and roads). This investment is counteracted by a generalized decrease in costs with the transition to a spring calving system with 200DC at 5.5KL (lower yield than PS1a). The price of milk is very low on this system but extremely few inputs are being used and the 2 family workers are sufficient to manage the cows. The pasture is rationed every 12 hours on a paddock system.

➔ **Some farmers evolve towards robotic milking to reach a higher work productivity PS3a:**

They were gearing up toward the digital revolution. They invested in 2 milking robots in 2010 to manage 120 high-yielding DC with 2 workers. The pasture is rationed with a front fence at a 12 hour rate on a large pasture block (70ha) and with an ideal arrangement around the farm linked with cow tracks. The farmer has rented in some land for silage further away from the farmhouse allowing a forage crop (and supplementation) compatible with yields of 9000L/year. This system still relies a lot on cake.

➔ **Some farmers evolve towards being support farmers for big dairy farms, PS8:**

Nearing retirement age, they did not wish to reinvest, manage calving or handle cattle anymore, they rear heifers and/or produce crops for other dairy farmers (Maize, Wholecrop, Winter wheat, Silage). A part of the acreage is rented out to potatoes farmers. For partner farmers they can keep more heifers to reduce the pressure on their land even following a TB outbreak.

➔ **Des agriculteurs proches de la retraite se convertissent en bovins viande PS11:**

Farmers on big ridges converted from dairying on meat production can reach a high LWG (Live Weight Gain) (>750g/day) and fatten their animals. Their rotation is based on long-lasting Ray-Gras TP (>8 years) (1 silage crop, 1 bales crop), winter wheat and rented potatoes. They are either, breeders and fatteners (PS11a) with 100 suckler cows or fatteners (Sp11b). They convert the buildings they own at the lowest possible cost.

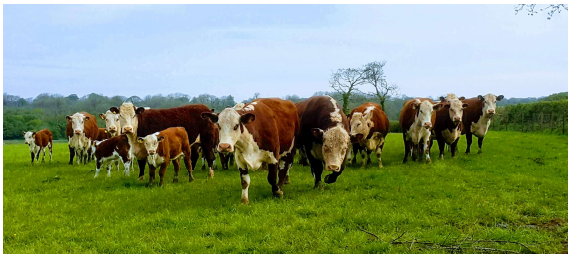


Figure 23: The beef markets is turning back towards British beef breed. Premiums can be obtained on Hereford beef at slaughter. (LT)

4. The end of direct coupled subsidies triggers a specialization among meat producers:

➔ **A specialization on beef production, either fattener or breeder & fattener:**

As soon as the coupled subsidies ended in 2003, these farmers abandoned sheep and concentrated their efforts on cattle. Low farmgate prices triggered them to double their herd and the area managed and convert to British breeds to obtain a bonus on the price of meat. This move will accelerate with the rise in input prices.

The suckler-cow specialists (PS12a) are a rented family farm following the strong drop (30%) in subsidies following the last CAP reform, this farmer took more land for rent (30ha) and increased the size of his livestock. There are 180 SC for 180ha with 2 calving periods (March and October). A high LWG of 1 kg/day is targeted for slaughtering beef between 24 and 28 months old. Calving is carried out indoors under CCTV to reduce the calving workload. The winter ration is based on bales for SC,

weaners. Others get silage and winter corn to reach the high LWG. They invest on loose housed sheds and cubicles.

The fast fatteners of the PS12b evolved to increase their number of cattle with a structure that is now entrepreneurial and renting most of the land. From 300 they now manage 750 cattle all year round with 440ha due to a recent expansion with 4 workers (including 1,5 family). The acreage is very scattered but entirely ploughable and does not allow easy grazing. The farmer divides 24 month old storecattle into 2 groups when they arrive. A group fattened quickly in less than 4 months in the stalls and a group with less potential fattened during 5 to 6 months in the field (with some food in the trophs). In winter this group of 300 cattle is kept outside. From April they rotationally graze a field every 2-3 days. Farmers and their employees work at a steady pace all year round; every week they have to feed, mulch, clean, buy light animals, sell heavy ones.

The complete fattening ration adopted from 1995 onwards to try to keep feeding costs low and consists in fodder beet, potato waste, bread waste, silage corn, winter corn and grass silage. These 2 farmers rent out some land to potatoe farmers with on average 40 ha each year.

Some farmers owned suckler-cow farms converted to organic (PS12c) instead of increasing the size of their herd. They got rid of their sheep herd and kept their 80 SC. The farming system logic is similar to other organic farms with forage turnips for feeding at the beginning and at the end of the grazing season, and winter wheat for fattening in addition to silage. Beef is sold at 30 month.

➔ **Some family farms increase their sheep herd over 1000 cows as a consequence of 2014 CAP flat rate:**

See Appendix 21

The end of coupled subdsidies reduced income per ewe while the cost of inputs increased, as these owner farmers specialised in sheep systems had a high proportion of permanent grassland in their land. To enhance their agricultural revenue, they increase the size of their sheep workshop.

Mules combining good prolificacy and very good maternal hardiness skills thanks to hybrid vigor were used to ensure a quality lamb production. **One choose to manage 1000 Mules (PS13a) with only 1 worker full time on 140ha.** It is a cost-effective system by with an outside lambing in March and no input used to feed lambs. Winter wheat and silage/bales are not intended for sheep. Late lambing causes the farmer to sell his lambs mainly from December to March. The lambs stay a long time on the farm but are grass-fed and it is possible to get 1.4 lambs per ewe at a price of £80/head. They are hard hit by the 2014 CAP reform but their low cost structure makes room for some resilience.

The other typical farm has 4 to 5 family worker (PS13b) and must generate an agricultural revenue for all and diversified its production all over the place. Sheep lambing remains early and indoor (3 weeks) to sell lambs early and obtain remunerative price (90£/head) with 1.7 lambs per ewe. The herd skyrockets from 700 to 2000 ewes by building new sheds. Farmers rents in some land (acreage 400ha) to produce crops for other farmers, and to rent out land to potatoes farmers. The livestock (including ewes) ration is partly done with maize and winter cereals in the wagon mixer.

In both cases the fodder is produced on the farm. These sheep farmers use wintering on neighboring dairy farms to have some grass left after lambing. Sheep are sold through auction markets. On sheep systems, the maximum size of the farm depends on the ability to manage the lambing peak and less on the various acute other work peaks from March to July (sorting, mowing, spraying, vaccination, etc.) where contractors would kick in.

5. Potatoes farmers evolution PS9 :

Farmers producing potatoes improved their kits. The tractors are more powerful (150-200 horsepower) and equipped with GPS, the harvesters still have 2 rows but now sort potatoes automatically, allowing to manage the harvest with less manpower. New destoners are also available. It is now possible for them to plant 140 ha of potatoes. The cooperative has diversified into low-cost potatoes for supermarkets (Aldi...) to complete their product range. With 2 kits it takes 8 temporary workers at harvest time in addition to the 3 active family members and 1 full time employee.

E. On small ridges, farmers have way less opportunities:

At the beginning of the 2000s the remaining dairy farmers that did not expand on small ridges are family owned farms 90 to 120DC and an abreast parlour.

As for farmers on big ridges, price pressure has pushed those who can to expand after 2000. It is young farmer-owners with 3 or 4 family worker who borrowed and invested. The first expansion was to go up to 150 DC at 7.5 KL with BFH and a new herringbone parlour. This being allowed by the expansion of the grazing platform on the same ridge and the setup of a 12 hours paddock system. Some more land rented in on gentle slopes and more distant ridges can be used for silage to total 100-120ha. The rotation does not change compared to the 90s, spring barley (wholecrop) and temporary pasture of 7-8 years alternate.

From 2008 onwards, with interest rates and milk prices still low, farmers did seek to expand or maintain their income while input prices rise.

If the land for expansion was scattered, farms implemented an autumn calving system to increase the number of DC to 250 on 120-150 ha. Farmers rely on grass and cake (60kg of pasture and 45kg of silage in winter) to reach 7.5KL, with 2-3 family assets everything is managed on their own. It's the **PS2a**.

If the land was still on the gentle ridges and slopes easily accessible to DC it was possible to reach 200 DC with a calving all year round system (PS4b). The higher yields at 8.5KL is allowed by the use of Wholecrop and concentrate. A grazing infrastructure is set up.

Some farmers kept managing their farms with 90 DC on narrow interfluves in the absence of PS4a income options: This farmer have not invested in farm equipment since the dairy specialisation of the 1970s. With 1.5 family workers on the farm since 1990, including one around retirement age, the possibilities of extending and obtaining a loan were not met. The working peaks for this agrarian system are milking with an outdated equipment which is hard work and building up fodder stocks. **These systems are disappearing with retirements**. In addition, these farmers get a very low milk price (27p/l). All the acreage is now in grassland, the slight increase in DC number meant that all the arable land close to the farm had to be part of the grazing platform. The income of the 2 farmers remains higher than that of beef farmers and explains that this type of production system has not yet disappeared.

➔ Farmers who stopped milking don't evolve much:

Farmers who went out of dairying on small ridges cannot achieve a sufficient LWG due to a lack of proper grassland and forage resources. They have a significant proportion of permanent pasture in ther acreage. The fattening process (calves→ 30month old) is divided between farms. They all have long-lasting PT (>10 years) with some spring barley harvested in wholecrop. Pre-retired people can keep systems with a high work requirement and peak workload requiring a lot of monitoring such as SC or calf rearing. On the other hand, the people that have an outside part time job that have taken over from this generation since 2005 cannot do so and rear animals over yearlings.

- Pre-retired farmers with 40 Suckler-Cows producing 12 and 24 months old storecattle (PS10a)
- Calf rearer who have limited wintering capacities (PS10b) due to the existing buildings of their old dairy system. Their forage resources are limited by the amount of permanent wet or sloping grassland available. Production of 12 and 24 months old storecattle.100 cattle/year.
- Fatteners (PS10c) try to fatten stores on grass until 30 month old. 100 cattle/year.
- In addition to the cattle workshop can be added a March lambing sheep workshop with 300 to 500 (PS10d) suffolk ewes. This is to use areas with a high proportion of permanent pasture.

Another possible option for these small ridges farms is to switch to organic to seek additional income through the higher raw product and the much higher subsidies. Especially with GlasTir. The stocking density decreases. (PS10e)

Younger farmers can add to these farming systems a laying hen workshop to work full time on their farm.

In the spring with the access to permanent pastures and the start of grass growth, farmers seek to increase the number of animals on the farm. In autumn, farmers and calf breeders will sell the animals in excess of their wintering capacity. Specialist fatteners buy cattle all year round.

Animal exchanges between the different actors take place on local livestock markets: Whitland and Carmarthen.

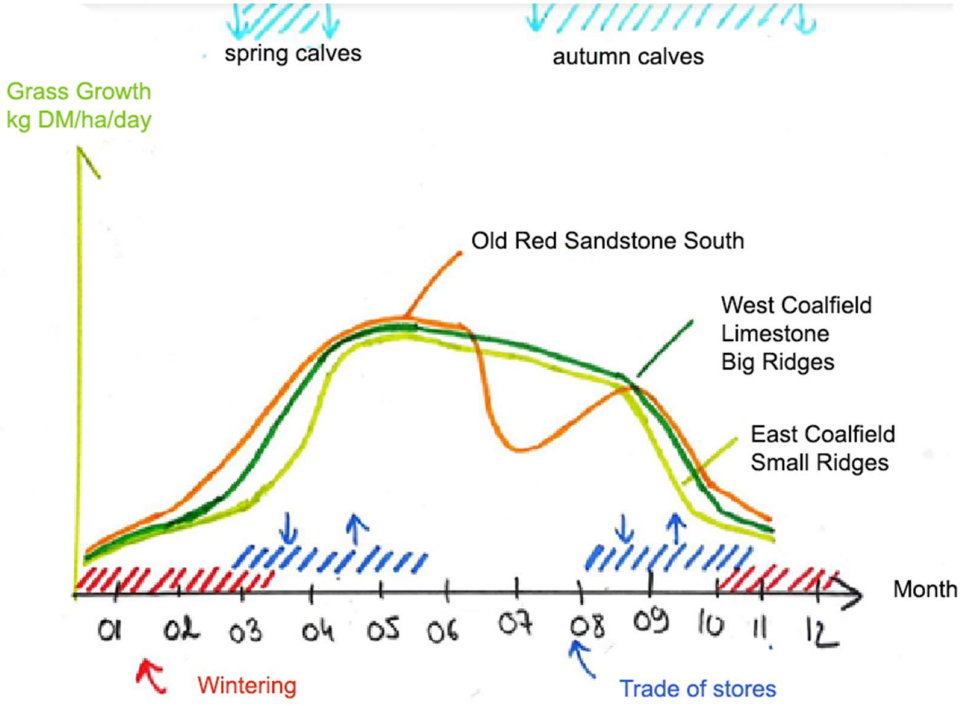


Figure 5 : Grass growth in the different Pembrokeshire landscapes, calving and storecattle trade.

Conclusion:

See Appendix 26

The Dairy industry has concentrated geographically since the liberalization of quotas system and rent. The size of the average dairy farms has more than doubled over the last 30 years and twice as big as French average dairy farm. A drive to intensify the production intensiveness took place with massive gains in terms of yield in the last decades. The price/input squeeze has triggered a specialization and a growth of every full-time farm with an impressive differentiation of production systems from the homogeneous dairy landscape of 1984. The differentiation took also place inside dairy systems. More importantly today there is a farm ecosystem, with farms working together and exchanging land, money, inputs and ouputs.

VII. Modeled farm system, economic results analysis, analysis of the possible future evolution for farming in Pembrokeshire:

Out of the economic interview I designed 30 different farms archetypes regrouped in 14 categories that represent the different ways farmers farm the land in Pembrokeshire. Each archetype is made out of 3-5 farms interviewed, for each one economic results have been computed from the way they work and a standardized cost base for every farm in Pembrokeshire (Appendix) some price, values evolve between systems due to the way people farm.

We have seen that the diversity of landscape that can be found in Pembrokeshire gives different production potential. For example a LWG or a potential milk yield per ha. From the farm archetypes we built we did a landscape of farming system in Pembrokeshire. In Pembrokeshire the differentiation process of agrarian system has been really violent. From 1945 to 1985 everything possible has been done to level up differences between farm types and get everyone to the same productivity level. From 1985 onwards, the liberalization of agricultural markets and quotas triggered a mass extinction among dairy farmer. Half of the small farms converting to beef. During the following years farmers answered to the input/output real price squeeze. Some farmers growing really big while others were looking for niche market or market with some added value to be found. The location of the farm system had a big impact on what choice people could make and where they were able to go. When we look at farming system "mapping" in Pembrokeshire Appendix X2 we can clearly see that there has been some steps for the different specialisation and that the real diversification in different production types has only been possible on Old Red Sandstone South and Limestone. Nowadays Pembrokeshire farming is a complex aggregate with farms working together between their outputs and inputs (rent-out land/rent-in or producing stores 12m old and using some…), a community which is more diverse and a lot smaller than 50 years ago. Diverse from an economic structure point of view, not only the gap between revenue, but also farmers age. It is clear that starting your farm in such a competitive market and area when you don't have any family farm or some kind of money to invest is nearly impossible.

The economics results we computed for every designed archetype shows this diversity problem with farms on the same productions but with very different results due to the landscape they are located in.

A. Etudes des résultats économiques des exploitations agricoles :

Economic graphs on Appendix 22, 23, 24, 25

Additional abbreviations: *RP: Raw Product IC: Intermediary Consumption DK: Capital Depreciation AV: Added Value*

➔ **How to create added value from the raw product result? :**

Dairy systems and potatoes farms are the ones with the highest raw production amount per hectare thanks to a high output out of the land. PS4a which is a dairy system has a lower raw product per hectare due to its lower stocking density. Intermediary consumption are way higher on dairy system than beef systems, the lowest ones will be found with heavily grass reliant systems.

Beef system have a lower AV (added value) per ha and per worker than dairy systems. Systems that have very high AV/ha are the ones who did invest in expensive farm equipment at some points (Wagon mixer, rotary parlour, robots or new potatoes kit) to reach an ever higher work productivity either on beef, dairy or crops. Some AV/ha go over 200€/ha on dairy systems and 100€/ha on beef.

➔ **A big difference with French farming systems:**

Pbs farming system rely very heavily on IC (60 to 70% of RP) this is due to the low amount of farm tools they have and the lack of real collaboration meaning they reduced their DK (10 to 20% of RP) compared to French farming systems (30% on dairy farms). Added value in production system is linked to a balance between the amount of money you can get for your output and how much inputs you use in your production process.

On Dairy systems, the cubicles, the milking parlour are the mainstays of the DK. Farm that did expand rapidly have way higher DK than others have higher DK because of their bulk investment. This

is a problem for PS3b & PS3c who bulk invested to adopt the 21st century revolution. Or the SP1a who did invest to kick start its rented spring calving and is only spanning its investment on his rent length.

Some farmers choose to try to produce a highly valuable goods to get a good AV, like 30m old beef or autumn milk or organic produces. Beef producer that fatten animals get twice as much AV/ha than the ones producing stores. Dairy farms have an added value over 1500€/ha as potatoes farmers do.

For every farm type there are opportunities to push up the RP per hectare or per worker using the same farm equipment allowing for a critical mass to be obtained to have scale economies and to dilute the cost of costly equipment. This is the case of PS3a,b & c for dairying.

In every production type systems some Production System tend to be oriented towards having the lowest input use possible; for example using grass based system or farmers that have a high percentage of permanent pasture. For dairy systems it would be PS1a & PS1b who have a 30 or 40% lower IC than other dairy systems per hectare but tend to have 20-30% lower RP. For beef & sheep systems we could compare PS13a and PS13b. On beef system the output price is the real problem, farmers struggle to get such added value as dairy system per hectare. This is particularly true for storecattle producer who might have IC/ha twice lower but the RP they get is well under 2 times lower. It shows the problem of producing a *commodity*, meaning a production which is not so interesting because aplenty is available. This is also the case of PS4a compared to other dairy systems because they work with brookers.

Fatteners system have a peculiar RP spread because they buy stores at a relatively high price, meaning their IC are high. But because they are selling animals fattened at 30month they tend to get a remuneration price allowing them to get a good AV. Their cattle turnover is very important.

Farms that have negative AV are beef and sheep farms, they tend to produce either stores or have a low number of animals and are typical of pre-retirement system.

➔ An enormous spread in terms of Agricultural Revenue, small farms depend heavily on subsidies:

From the graph of agricultural revenue per family worker we can see that dairy farmers over 200 DC don't rely much on subsidies to get over the 20000€/year of the UK living wage. A share of 10-15% of the revenue is from subsidies. This is due to the fact that these farmers rent a lot of land with the subsidies being set back to the landowner.

Dairy farmers under 200 DC can hardly stay over 20000€/year/family worker without subsidies and this even if they try to push the cows dairy yield. PS3a & PS4a.

We can see that the Agricultural Revenue comparison between farms seems relatively reasonable compared to the AV spread. This is due to how heavy are loan interest payment and rents in some farming system renting a lot of land and most of all of employee (40000€/year/worker).

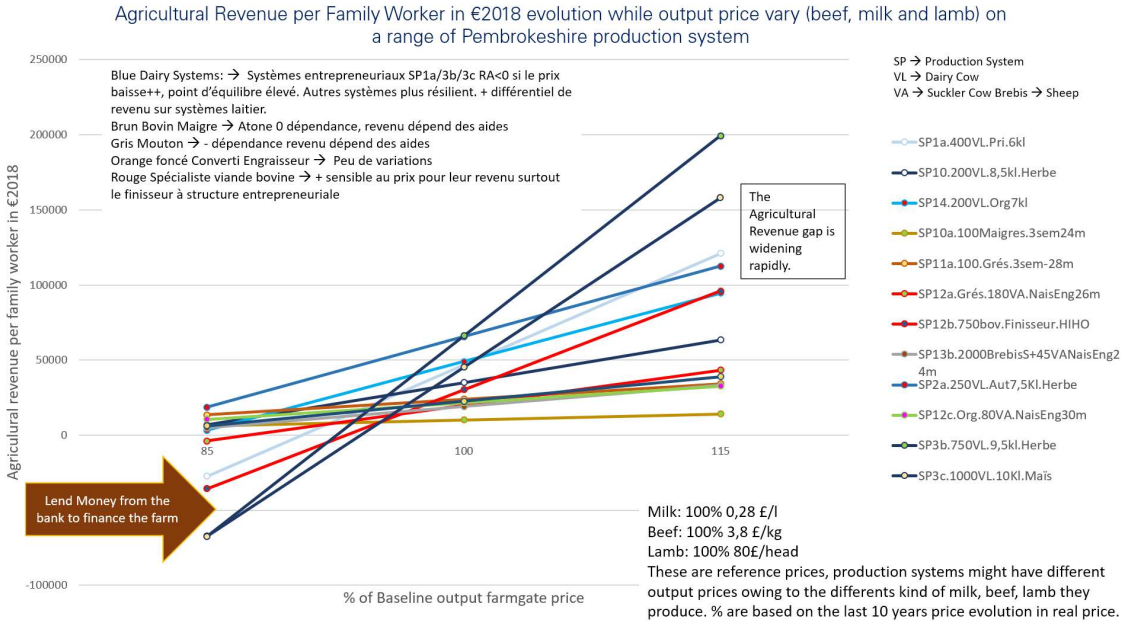
The PS9 specialized on potatoes cropping is very remunerating for farmer and they don't depend a lot on subsidies to survive giving farmers' firm foundations to build up and expand on a very competitive market. Rentals for potatoes are included inside IC. The heavy and hefty investment done to specialize on this crop are drowned into the acreage cropped.

Every beef and sheep system is less remunerating than milk production, nearly all of them are under 20000€/family worker including subsidies from the CAP. The CAP payment represent from 50 to 100% of their agricultural revenue. Production systems producing store cattle are under the GlasTir scheme which allows them to get a higher amount of subsidies. Though they are the one most at risk without subsidies. Being able to fatten up beef allows for an higher agricultural revenue. Generally the higher the LWG the better the agricultural revenue.

On ovine production systems, PS13b with its 2000 ewes is the one that depends less on subsidies though it still represents 80% of its revenue. Meanwhile though it has a very low cost structure, PS13a with 1000 ewes is the one relying the most on subsidies. PS10e has all its revenue coming from the CAP subsidies. For PS13b it is important to note that they diversified into growing crops and renting out some land for potatoes.

Finally support farmers PS8 have an agricultural revenue way over 20000€ and greater than beef and ovine systems. It stills depends heavily on the partner farms and how they are doing financially. Farmers that rent-out farmers tend to have an agricultural revenue between 10 & 17000€ each year that complements a retirement pension or another job. We can see very well that some of this categories have higher agricultural revenue than some beef production systems. We have to note that your opportunities for this depends wildly on where you are located in the landscape and whether you are close to some big dairy farms. For example PS10a & PS10e didn't have so many opportunities to get along with.

B. Sensibility Analysis:

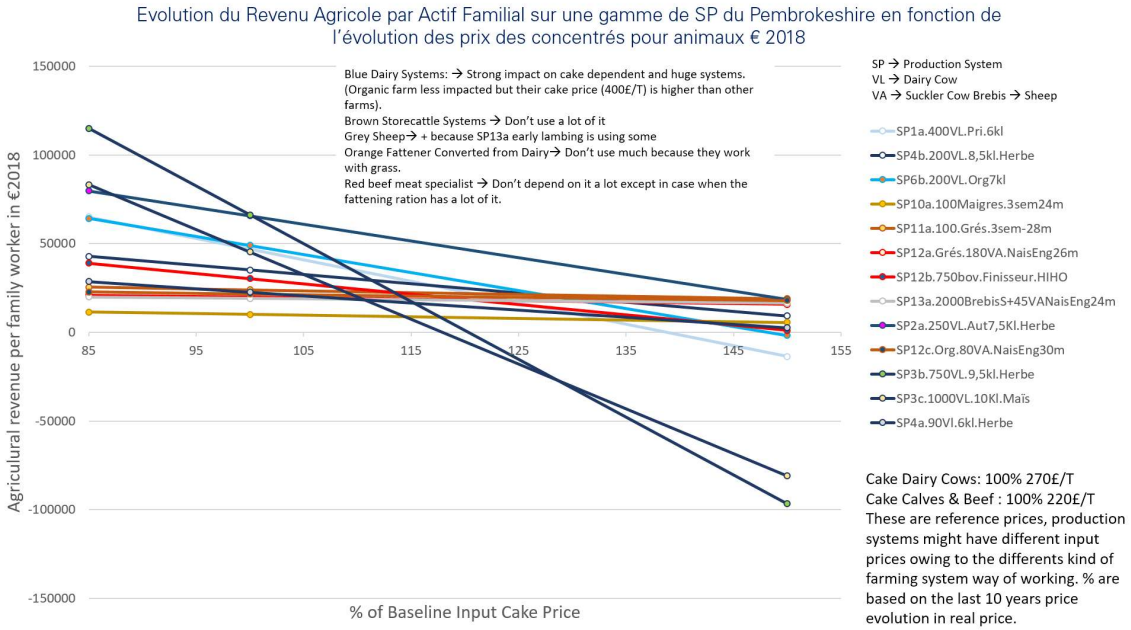


➔ Agricultural revenue per family worker evolution in face of farmgate price evolution :

All agricultural revenue are given in €2018 and include CAP payments

We did some sensibility test to see how farms could react to market evolutions. On the one side we monitored their economic results while output price vary and then we did the same for input price variation (cake and petrol prices). We looked at the price variations over the last 10 years to give some appropriate range to our test.

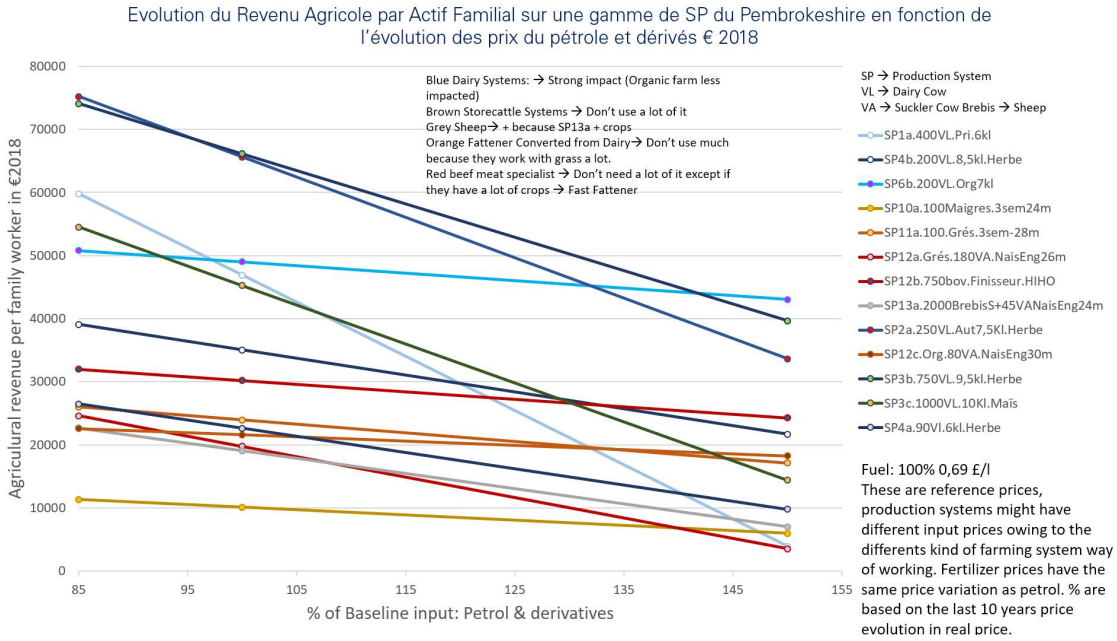
For output price variation we looked at a range between 85% and 115% of a reference price on every production. We can clearly see that there are some stark differences between production system types. Farms with an entrepreneurial way of working tend to struggle really quick if price are going down due to their huge size (PS3c, b, PS1a, PS12b or PS12a). They are losing a huge amount of money when a crisis hit. To answer hit like in 2016 they would cut on cake reduce cows yield and borrow some money from the bank. These being deemed too big to fail and can have access to a big overdraft. But if price are to improve they are the one that will make the most of it and more than compensate their losses. Their steep lines is showing off the fact that they have a huge production volume and high costs. Family farmers are less troubled by price variations, even if price get really bad they stay above the 0 line, they seem more resilient. We can see that a number of added value production including autumn calving dairy farms and organic farmers tend to be more resilient to price variation even if their cost are high. They tend to be more protected from market evolution. Storecattle and sheep farmers don't have much agricultural revenue variation, they make most of their revenue out of the BPS. The CAP helps each and every farm system to stanch the eventual losses in case of price crisis. If prices get really high, the differentiation process pays its toll and the gap between Dairy Farmers, Entrepreneurs and Family beef farmers widens really quickly in terms of Agricultural Revenue.



➔ **Agricultural revenue per family worker evolution in face of cake price evolution :**

Cake price variations that we retained are -15% and +55% from today's reference price. Cake price are linked to soybean and cereals prices evolution. On the graph we can easily see that the steepest lines are the systems that depend most on cake. It includes high yielding dairy farms and most notably high yielding dairy cows relying a lot on grass which means that cake is allowing them to reach their target yield. Dairy farms in general feel the heat of the price rise while beef farm don't. This is due to the fact that they don't use so much cake and use a lot of farm produced fodder or byproducts from other industries.

Entrepreneur's dairy farms are in a tough economic environment if cake price go over +15%. The choice of PS3c to produce most of its fodder with a range of high energy crops allows it to be more resilient than PS3a. Smaller dairy farms are not in such pain and can withstands a 20% cake price rise without having their agricultural revenue going under 20K€. This shows Pembrokeshire's farmers' big self-production of fodder even when the yields are high.



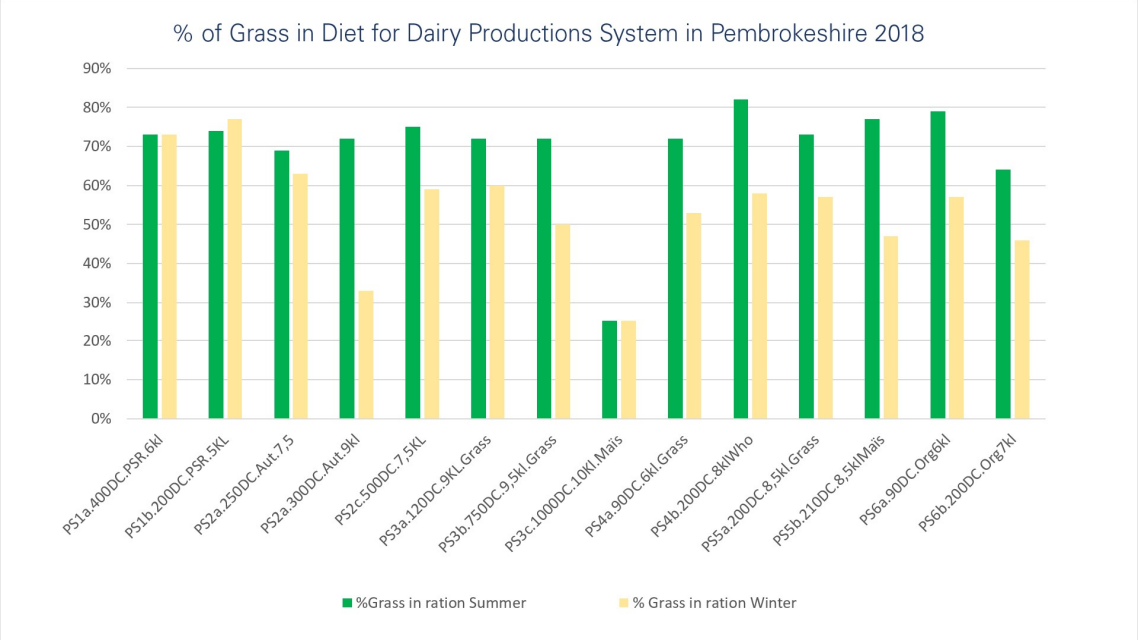
➔ Agricultural revenue per family worker evolution in face of petrol (and derivative) price evolution:

On petrol and its derivative we choose to have price vary from -15% to +50% from today's reference. Fuel and fertilizer heavy farming systems tend to have the steepest line meaning they really feel badly the crush from increasing petrol price. This is the case of the spring calving PS1a whose biggest single cost is fertilizer to keep pasture producing a huge amount of grass. PS3b and c are impacted as well as autumn calver. Organic farming system don't feel the impact because of they don't fertilize, beef farmer are not heavy users of fertilizer and fuel and are not really heavily impacted. A petrol crisis would cut by half the agricultural revenue of Pembrokeshire's farmers. For potatoes farmers, the agricultural revenue would go down from 94K€ to 60K€ still way above of the 20K€ waistline. A rise in fuel price of 10% would trigger Agricultural revenue per family worker to drop down by 10 to 20%. A big amount of family farmers would drop below 20K€.

On the whole looking at sensibility tests it seems that dairy farmers would be hit the hardest by a wild prices variations. Most notably facing a steep rise in input price. Niche market (organic, autumn calver…) really help to alleviate the pressure from these markets evolutions. The CAP is playing a key part in keeping farming systems and particularly family operated ones above the 0 line during problematic times. It simply allows these relatively smalls units compared to big farms to get going without too much of an overdraft (of which they have trouble accessing).

To conclude the sensibility analysis it seems quite important to note that dairy farms will be the one to be impacted in case of big price variations (increase/decrease). Most notably when input prices increase, agricultural revenue dwindle sharply. The CAP is acting as a buffer to temper down market instability (most notably the first pillar) for farms that can't access the huge overdrafts available for big dairy farms. Either farms are sensible to prices variations or they are sensible to CAP subsidies to keep their revenue up. Either way these two branches will be severely impacted by brexit.

C. Environmental performance of Pembrokeshire Farming, a qualitative analysis:

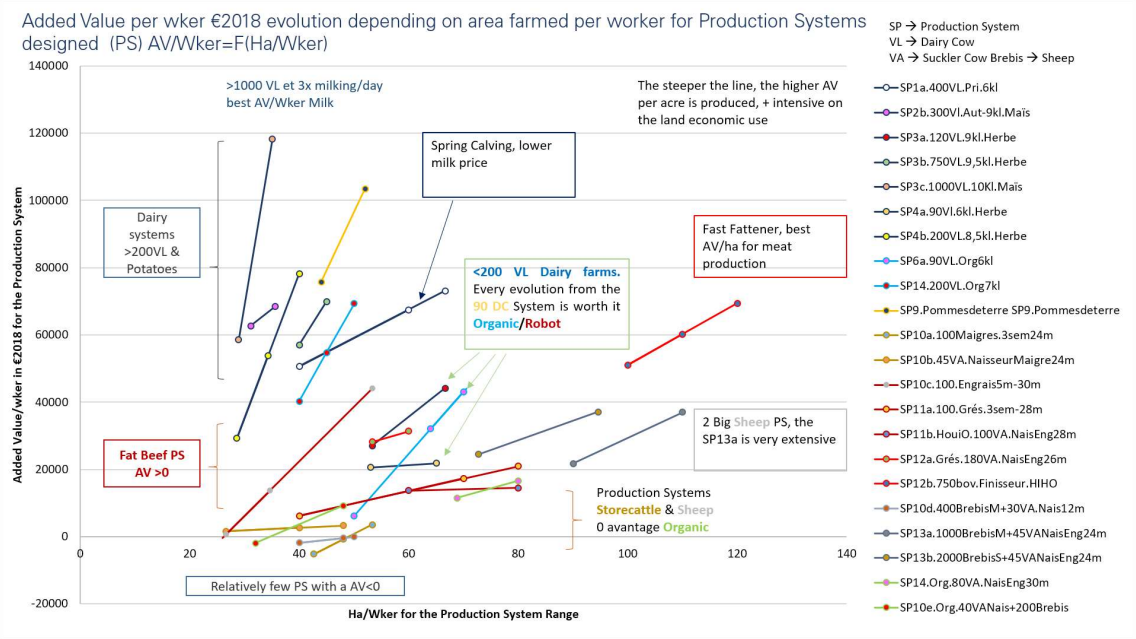


Dairy cows are widely considered as the worst performers in Pembrokeshire for the environmental impact. But even dairy cows ration is grass heavy during summer and winter which is rather a good measure compared to France. The only exception being PS3c with its more than 1000DC that need a lot of energy crops. But on the whole only 4 PS are under 75% of their acreage under grass (permanent or renewed grassland) PS3c, PS12b (fast fattener), the support farmer PS8 and the potatoes farmers PS9. It extremely low. Therefore input use is the key component to understand how environmentally friendly are each farming system. But some grass only farms for example PS3b and PS1a are really fertilizer heavy farms because they are trying to get the most of their pasture and they are no better for the environment than PS3c. Farms effluents are a problem on every dairy farms.

Here are some key proposals to tackle this issue:

- A holistic approach much like the agrarian diagnosis is necessary to assess farms environmental impact.
- Green crops and particularly nitrates consuming ones would be useful for farms even though they come at a cost to mitigate the heavy nitrogen fertilization.
- Covering the yards of dairy farms and try to help reduce the amount of slurry to spread in this rainy area, to control the time when you have to spread it.

D. Pembrokeshire production systems, for each system a range of size: added value production per hectare in Pembrokeshire farming systems depending on the acreage farmed by worker.



Each production system is designed for different sizes and number of work we computed the farms economic results for these. The acreage worked by each worker is allowing us to help represent completely the scope of Pembrokeshire farming. The agricultural revenue and added value is allowing us to have economic results for the scope of the production system.

A steep line for a production system would mean that the production intensity is high per worker and hectare in economic term. A slowly rising line would mean that economic production intensity is lower per hectare and worker. A downhill line would mean that the bigger you get the less economic performance you have.

We choose the 20K€ line as the living wage for the UK it is represented on the agricultural revenue graph.

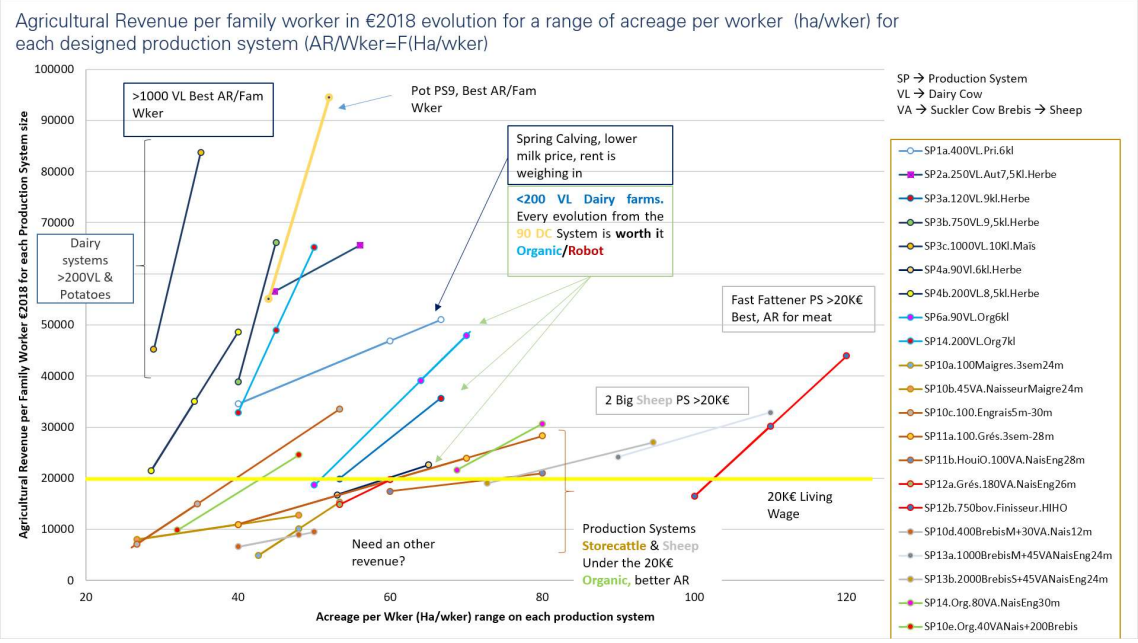
For farming systems added value creation is at best with potatoes farmers and dairy farm that took up the 21st century agricultural revolution (PS3b,c or PS2b…) and this no matter how big they farm. They have a high economic performance per hectare and per worker.

Beef farmers that sell storecattle or sheep farmers have really slowly rising line showing off their low added value produced per hectare and per worker. They are globally really extensive in their use of the land compared to dairy farmers thus the lower coefficient. Big sheep farms fare better than small ones in terms of economic performance evolution when the size is increasing.

On dairy farms it quite clear that the PS4a which is the smallest dairy farms with less than 100 DC is not making much more money if it grows. The differentiation on this size of farms that happened on big ridges allowed the PS3a and PS6a (robot and organic) to get a better economic performance and then an incentive to increase the farm size.

PS1a the spring calver representative here has a slower rising line than PS3b or PS3a or similarly sized farms this is due to an all grass low yielding production that is badly paid during spring. Autumn calver fare better and have a steep line showing that they produce a lot more added value by increasing. This is also the case of 200 DC farms that have relatively high yields. The smallest beef and sheep systems tend to have their lower end size nearly having a negative added value.

A. Agricultural Revenue on acreage spectrum for each farming system:



It is quite clear why only 4 dairy farms interviewed were under 100DC. PS4a, PS3a and PS6a are close to this limit and they are close to the 20K€ waistline with the lower end of their size spectrum. A smaller dairy farms would not make enough money on a work intensive system.

Compared to the added value graph, the graphs limits for the maximum and the minimum are getting smaller on the agricultural revenue per family worker graph. And we can see that some farms get up and down in terms of compared position. This is due to rent payments and interest payments as well as the payback to landlords of a part of the CAP subsidies. This is particularly true for entrepreneurs systems and those who took up the 21st agricultural revolution. For example PS2b, PS2c, PS3a or PS3b who tend to go down and close the gap. Smallest farm tend to get help from the CAP to hike up from their low added value.

We can clearly see that some beef and sheep farmers are well under the 20K€ waistline for their agricultural revenue per family worker. Some production systems lines are partly under this limit, these systems exist. Farmers are working part time outside of the farm or have a different family situation (semi-retired, young children…). But this explains the drive for trying to expand farms if possible to cater for more animals.

A lot of subsidies reliant production systems seem to be just around the 20K€ waistline (either above or below) particularly in beef and sheep. Meaning that the lower subvention get the bigger farmers have to increase a lot to try either to make a revenue out of farming (slowly rising line) or get more subsidies if they are land-based.

B. The 2014 CAP's consequences on farming systems in Pembrokeshire:

Dairy farmers over 200 DC lost a lot in the 2014 CAP (15-20%) but they don't rely a lot on subsidies for their agricultural revenue. Le last CAP had then a relatively low impact on dairy farming system. On the contrary small dairy farmers under 120 DC lost a lot and it meant much more to them. The 2nd Pillar for Wales had nearly no impact on dairy farmers. Farmers that went into agro-environmental scheme have over 200 dairy-cows with low stocking density (under 2 LCU/ha). They subscribed access to farmland, interest sites or biodiversity schemes. This set of measures had no impact on farming systems.

Beef & ovine farming systems that specialized heavily following coupled CAP aid lost ranging from 15-30%. Smaller farms were less hurt because they had no such historic references and the redistributive payment over the 54 first ha. Several beef and sheep had to hike up their herd size, notably suckler cows and fattening cattle. This farmers benefited from GlasTir, rather easily.

Organic farmers receive very substantial subsidies which represent at least 40% of their agricultural revenue even for dairy farmers. GlasTir organic and other parts of this scheme represent at least 1/5th of their total subsidies. Low stocking rates of these farming systems go well with GlasTir way of thinking.

GlasTir scheme did not favor any investment for farmers and is definitely not a scheme triggering a farming system evolution. Furthermore, the amount of money you get in this preservation scheme for an hectare registered would be under the AV/ha that people can have access to with dairying or potatoes farming.

C. What would be Pembrokeshire's farming evolution after the end of the CAP scheme:

Today the Welsh Government is willing to introduce a good payment scheme in 2021. But first it will certainly set up a NVZ around 2020 that would encompass Pembrokeshire.

The good payment scheme if it was based on an environmental preservation scheme would certainly be constraining, much more than GlasTir was. Farmers that really need subsidies would certainly take it mostly because it would be more than 60-70% of their agricultural revenue and diminish their farm output. Though dairy farms won't be eligible as of potatoes farmers and inputs intensive beef farms. It means that every farm creating some added value per hectare would not be subsidies supported and would only be market driven (except for smaller dairy units).

If the scheme is to be inclusive it has to be a scheme to guide evolution while trying not to forget about farmers agricultural revenue and the fact that most of them face a very harsh price pressure from the oligopoly of supermarkets and of the food transformation industry. It means as well that payment to preserve a plot of land, a hedge have to compensate for the loss in terms of production or to get a higher agricultural revenue. Farmers that still have to live from their farming activity and particularly beef farmers would have no choice but to eventually drop out of farming.

Dairy farms with the NVZ would be looking to expand with more land, and try to expand to pay for the increase in rent due to land pressure. Today few dairy production systems apart from the organic ones are under the 170kg/ha of animal origin nitrogen limit. It would mean that a lot of beef farmers would get out of business, all the more if the land pressure triggers rent to get over the amount farmers lost with the new subsidies scheme. Potatoes farming and dairy farming would be the mainstay of Pembrokeshire farming with a lot more hobby farmer. The support industry behind farms would collapse because beef farms represent at least 50% of Pembrokeshire's farms (according to the interviews).

Another concern of farmers in Pembrokeshire would be that the good payment's scheme would focus on uplands farmers and not so much on lowlands farmers. Making it even more difficult to get it and keep the beef farmer's agricultural revenue afloat.

Finally the CAP BPS scheme was acting as a crisis buffer for farmers with its relatively high subsidy distributed every year. After the end of the BPS it is unlikely that the good payment scheme subsidy would be able to play this part making numerous production systems vulnerable to the evolution of market prices.

But in the UK, environment awareness is getting stronger and as austerity plans have been at hitting hard communities for the last 15 years it is very hard to keep the BPS as it is after 2020 while the amount of people working in the farming sector is decreasing.

Our proposal would be to build evolution plans, meaning having a set of measure for farms to be more environmentally friendly through grants. The main problems Welsh Government is facing is not so much how to make this scheme fair but much more how to get towards food security, farmers market security.

D. What will be the impact of Brexit on Pembrokeshire farming?

In case of a Brexit deal it is very likely that there will be a status quo with EU rules and legislation on food and safety applying to UK food sector. Agricultural goods will flow in and out of the UK and the UK will still benefit from its comparative benefit on livestock farming compared to others EU member states. Though it is crystal clear that as soon as the UK will set sail away from the CAP there will be a dumping problem from the other EU member states. This loss in terms of competitiveness will mean that UK farmers will have to adapt. During a crisis on some farm sector of some sort, epizootic disease or a drop in world prices UK farmers won't have any buffer to face it compared to other EU farmers.

For Pembrokeshire it would mean that every Pembrokeshire agricultural output will be at threat of facing EU unloading its surpluses on the UK market. Sheep farmers would benefit hugely from the deal concluding, their main market for lambs being kept open and accessible to them.

UK is no longer a rural country, farming is being pressured by "industrial" development and tourism development in lot of Lowlands' areas. The lack of real buffer and an increased EU competition would be detrimental to the very subsistence of money making farming. This pressure could all come down to a generalized move towards expansion and a further concentration of dairy farms to make a living.

But if a no deal gets through the consequences would be starker. According to the 31st of October PM tariff document 88% of agricultural would not be taxed to get inside the UK agricultural market but the EU will lock down its border with a fresh range of tariffs and quotas. It would then be a one way flow of food entering the UK market with the dumping still working but the complete loss of an export market with 40% tariffs on lambs. The £ would devaluate much more (-10%) but whatever the other consequences in an increasing inflation context, it is not likely that agricultural price will increase in real terms. UK supermarket that hold the bulk of British food sell won't hike up prices on food prices to keep people buying.

Deal or no deal the £ already dropped down from where it was allowing for more competitive export (on lambs but not much more) but endearing the workforce cost and preventing any cheap labor to flow in from EU member states. All the more with the Brexit effect on people feeling of acceptance in the UK.

A new squeeze might appear between imported input prices (devaluation) (fuel, fertilizer, sprays…) and output prices triggering a new differentiation and selection move among farms.

From a food security point of view it would be interesting for the UK to try to diversify away from livestock farming to get food security on other food including vegetables. Targeting UK agricultural output that help maintain food security and that is not competitive through EU CAP dumping would be of much interest for the national added value creation.

Conclusion:

Since 1973, the United Kingdom has pursued an agricultural policy poles apart from France or Germany, although it is part of the EU. The mainstay has often been to try to provide low-cost food to promote affordable work costs. The balance of payments and treasury accounts being watched upon carefully by conservative and labour leaders.

After the 2nd World War, Pbs knew a strong and sustained development of milk production for every social category of farmers, even in the least favorable areas. Silage in this rather rainy area has transformed farming systems. This unprecedented momentum was stopped by quotas. An unprecedented selection process took place with the quota market, the liberalization of the milk market and the reform of tenancy agreements. The farms were under the farmgate milk price pressure pushing either for investment and extension or a conversion/retirement. Farms have become hyper specialized or have increased their number of DC in a head-on rush.

At the end of their dairy activity, many farmers converted to beef or renting out land allowing expanding dairy farms to get some land to fuel their expansion. This wave of conversion due to each individual's possibilities has also allowed the emergence of high added-value main crop potato industry in the area.

CAP devolution to Wales from 2003 and the choice to maintain a historical reference for subsidies level has limited the effects of the crises. The second pillar of the CAP in Wales has focused on the preservation of biodiversity and conservation measures. Epizootics outbreaks have had a greater impact on farm diversification; BSE from 90 to 2000 and then TB.

The CAP in Wales has certainly triggered the selection among dairy farms with the quotas market. But it has also made it possible to keep a large number of farms in operation and to maintain a large number of jobs and to act as a mattress to cushion price crises. The 2014 reform in our study region has helped to maintain a lot of small family farm in the business. The discontinuation of CAP subsidies following Brexit will have consequences for the development of agriculture in Pembrokeshire. The size of the structures could increase on the remunerative production of potatoes and milk, while beef cattle producers will not be able to continue.

Future Welsh agricultural policy will strongly influence the development of Pembrokeshire agriculture. Small family farms provide the basis for a fragile structure with an ecosystem of farms exchanging inputs/outputs and maintained by the CAP. A race forward on farm size to maintain income will create conflicts in Pembrokeshire in the face of rising conservationist and environmentalist opinions in a highly tourist region.

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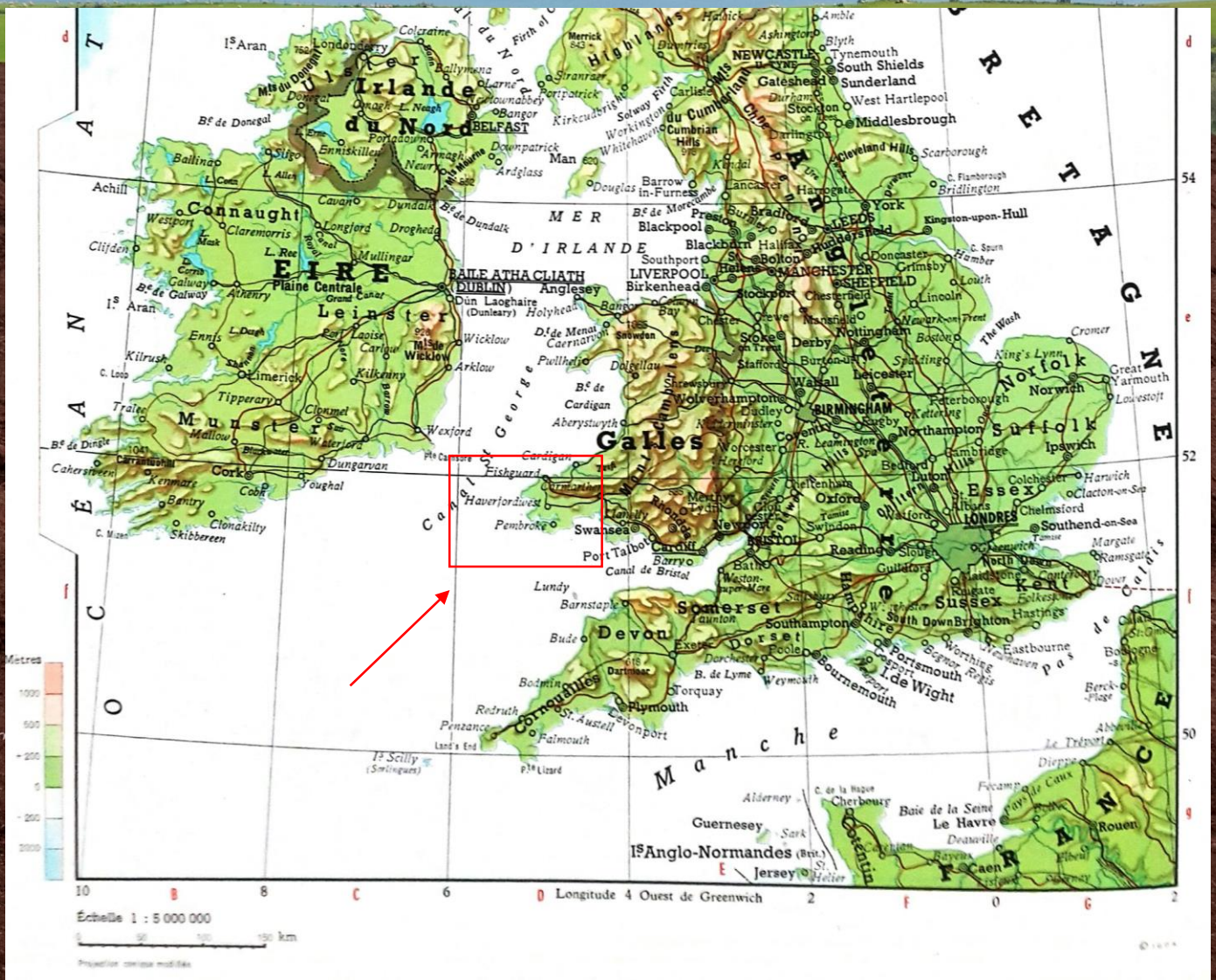
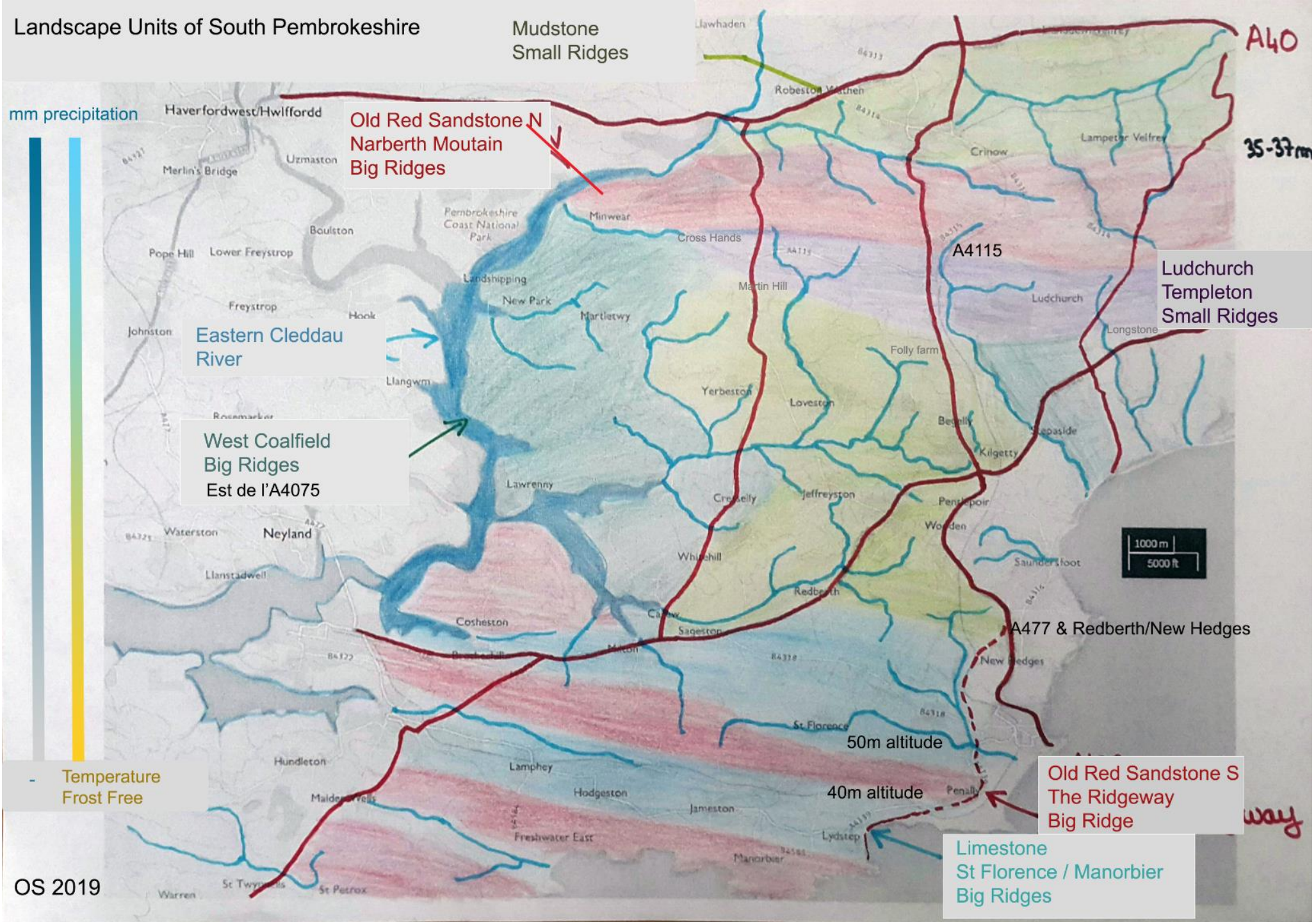
Agrarian Diagnosis of South Pembrokeshire (South-West Wales – UK)

Maps & Appendis

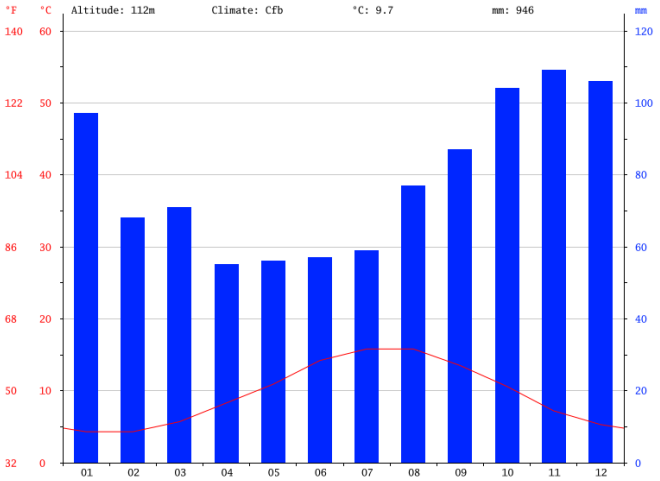


Appendix 1 : Pembrokeshire location on a global UK atlas map (LT & Larousse1954)


Landscape Units of South Pembrokeshire
Mudstone
Small Ridges
mm precipitation
Haverfordwest/Hwlffordd
Old Red Sandstone N
Narberth Moutain
Big Ridges
Eastern Cleddau
River
West Coalfield
Big Ridges
Est de l'A4075
A4115
Ludchurch
Templeton
Small Ridges
A40
35-37mm
A477 & Redberth/New Hedges
50m altitude
40m altitude
Old Red Sandstone S
The Ridgeway
Big Ridge
Limestone
St Florence / Manorbier
Big Ridges
Temperature
Frost Free
OS 2019
1000 m
5000 ft
Pembrokeshire Coast National Park
Merlin's Bridge
Uzmaston
Boulston
Pope Hill
Lower Freystrop
Freystrop
Johnston
Hook
Landshipping
New Park
Martletwy
Minwear
Cross Hands
Martin Hill
Crinow
Ludchurch
Longstone
Folly farm
Yerbeston
Loveston
Begelly
Kilgetty
Lawrenny
Jeffreyston
Penalpoir
Waterston
Neyland
Llanstadwell
Whitehill
Redberth
Saundersfoot
Cosheston
Sageston
Hundleton
Lamphey
Hodgeston
Jameston
Freshwater East
Manorbier
Lydstep
Penally
St Florence
Warren
St Petrox
Llawhaden
Robeston Wathen
Lampeter Velfrey
Appendix 2 : Map of the area studied in South Pembrokeshire with the differents landscape units (LT & OS 2019 basemap)

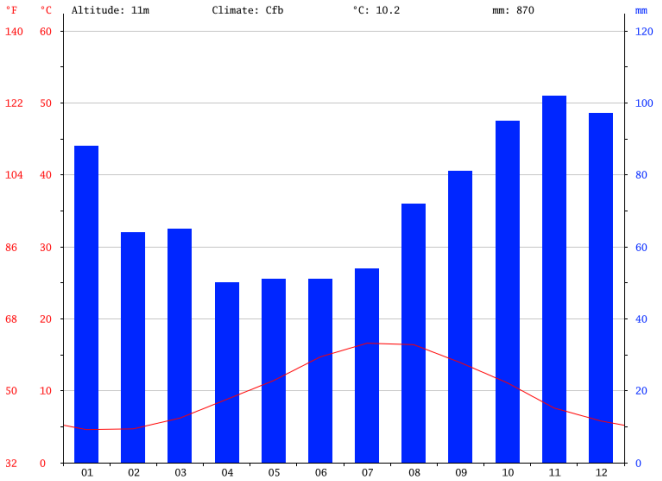
Narberth (N) and Manorbier (S), two slightly different climates:

Narberth



- Higher rainfall and more frequent, particularly after August
- 0,5 à 1°C of Temperature difference

Manorbier



- No frost from february
- Less rainfall (70 mm less)
- sea buffer impact

Appendix 3 : Comparison of the climate in 2 in the North and the South of South Pembrokeshire, we notice a gradient in terms of precipitation and temperature (LT & Climate Data.org)

SMALL RIDGES - DAIRY

Month	1	2	3	4	5	6	7	8	9	10	11	12	
Temporary Grassland			Sl + Fert		Sil	Sil			Bales				
					Sl + Fert		Fert						
	Sl		Fert	Early	5								Fert/Grazing Cycle
Permanent Grassland				End	5				Mid				
			Mid		Sl +						Sl		Fert/Grazing Cycle
Spring Corn		Sl	Muck	Plant	5			Who - Pl	PL				
				(SS) ->	5			<- Muck	RG				
Dairy				Grazing & Cake							Silage & Cake		
Youngstock				Grazing							Silage		

BIG RIDGES - DAIRY

Month	1	2	3	4	5	6	7	8	9	10	11	12	
Spring Corn		Sl	Muck	Pl				Who - PL	PL				
				(SS) ->				<- Muck	RG Pat & Sil				
Temporary Grassland	Sl		Sl+Fert		Sil	Sil		Sil	Bales				
		Sl			Sl + Fert	Fert							
			Mid								Sl		Fert/Grazing Cycle
Permanent Grassland				Early					End				
												Sl	Fert/Grazing Cycle
Dairy			Grazing & Cake								Silage & Cake		
Youngstock			Grazing								Silage		

Appendix 4 : Simplified typical use of the land for 2 dairy farms one on small ridges the other on big ridges, apart for the yield difference, there is a a differnent work agenda. (LT from interviews)

Appendix 5 : Landscape on big ridges on the Coalfield West (Photo LT – Minwear), Trees are in the valleys and some hedges typical of Pembrokeshire line big sized fields. ***March***

Appendix 6 : Landscape on the Old Red Sandstone North from the North (Photo LT – Lampeter). This landscapes tops at 180m of altitude. Big fields are delimited by hedges. ***March***

Appendix 7 : Landscape on Limestone based big ridges (Photo LT – from the Ridgeway to the North). ***March***

In March we can see that 95% of the landscape is under grass

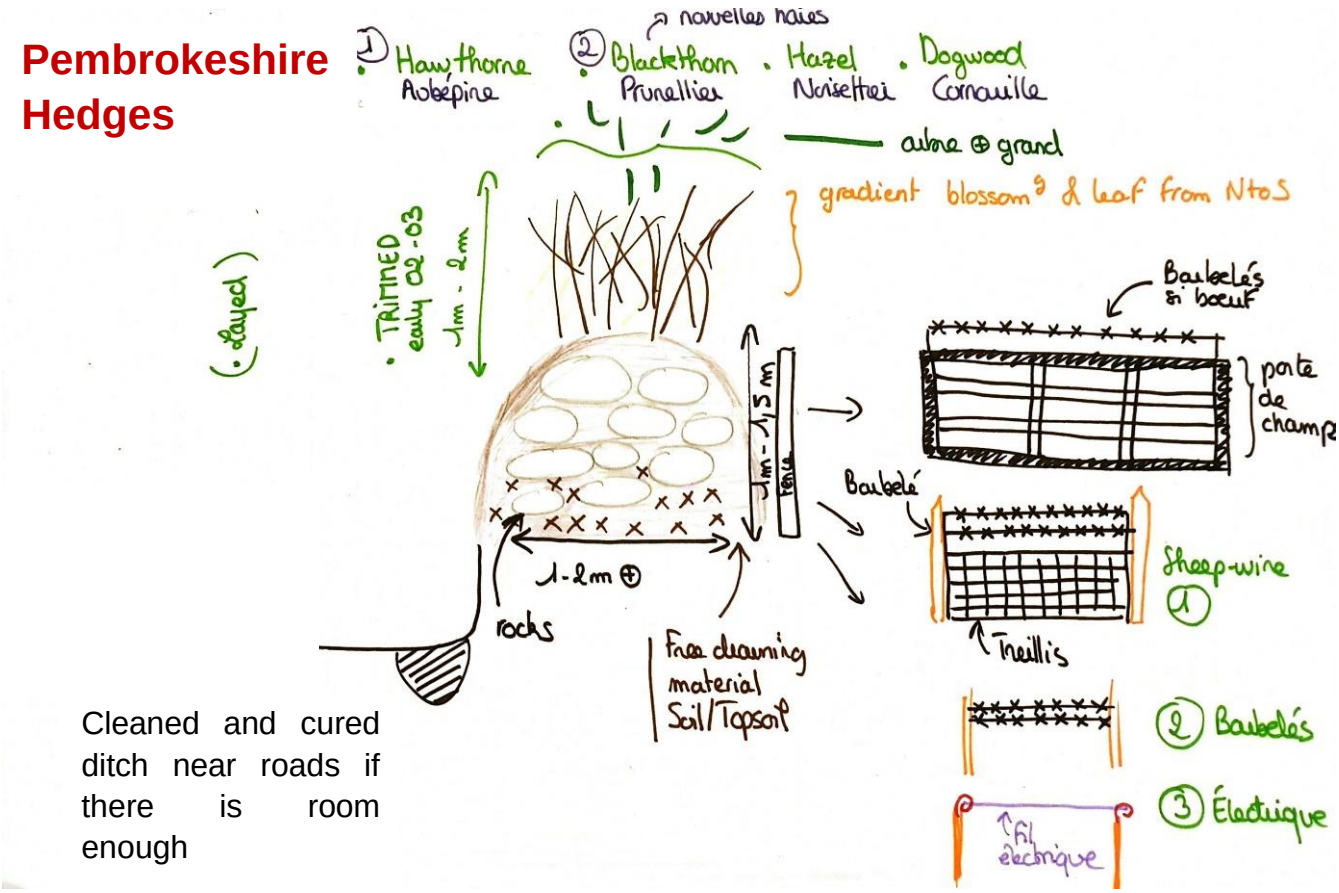
Appendix 8 : Landscape on small ridges – Coalfield east (Photo LT – Reynalton), fields are smaller and the tree cover is denser in the valleys. ***MARCH***

Appendix 9 : Landscape at Ludchurch/Templeton (Photo LT – Ludchurch) on small ridges. ***MARCH***

Appendix 10 : Landscape on Old Red Sandstone South Ridges from the South (Photo LT – The Ridgeway), we can spot halfway in the slope, permanent grassland. Fields are big, potatoes and spring crops are being ploughed in. ***April-May***

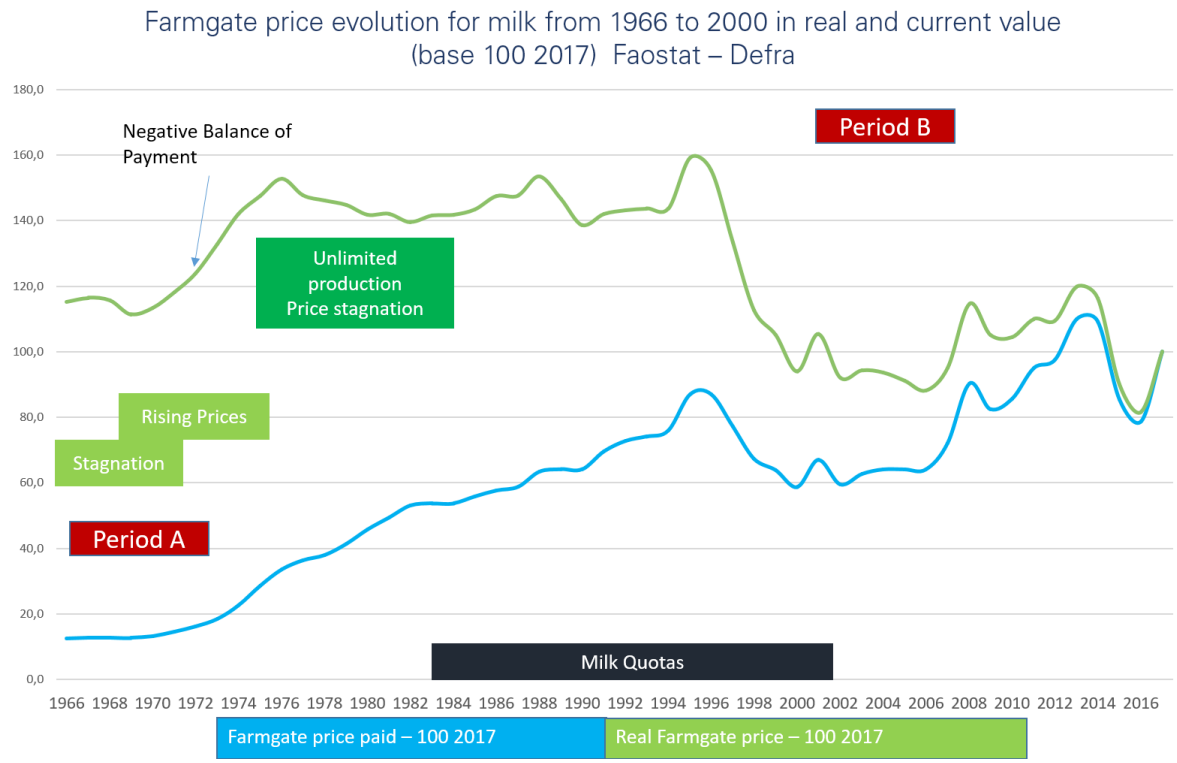
Appendix 11 : Landscape on Limestone at St Florence (Photo LT – From the Ridgeway). The first silage cut just took place and some fields are being ploughed in. ***April-May***

Pembrokeshire Hedges

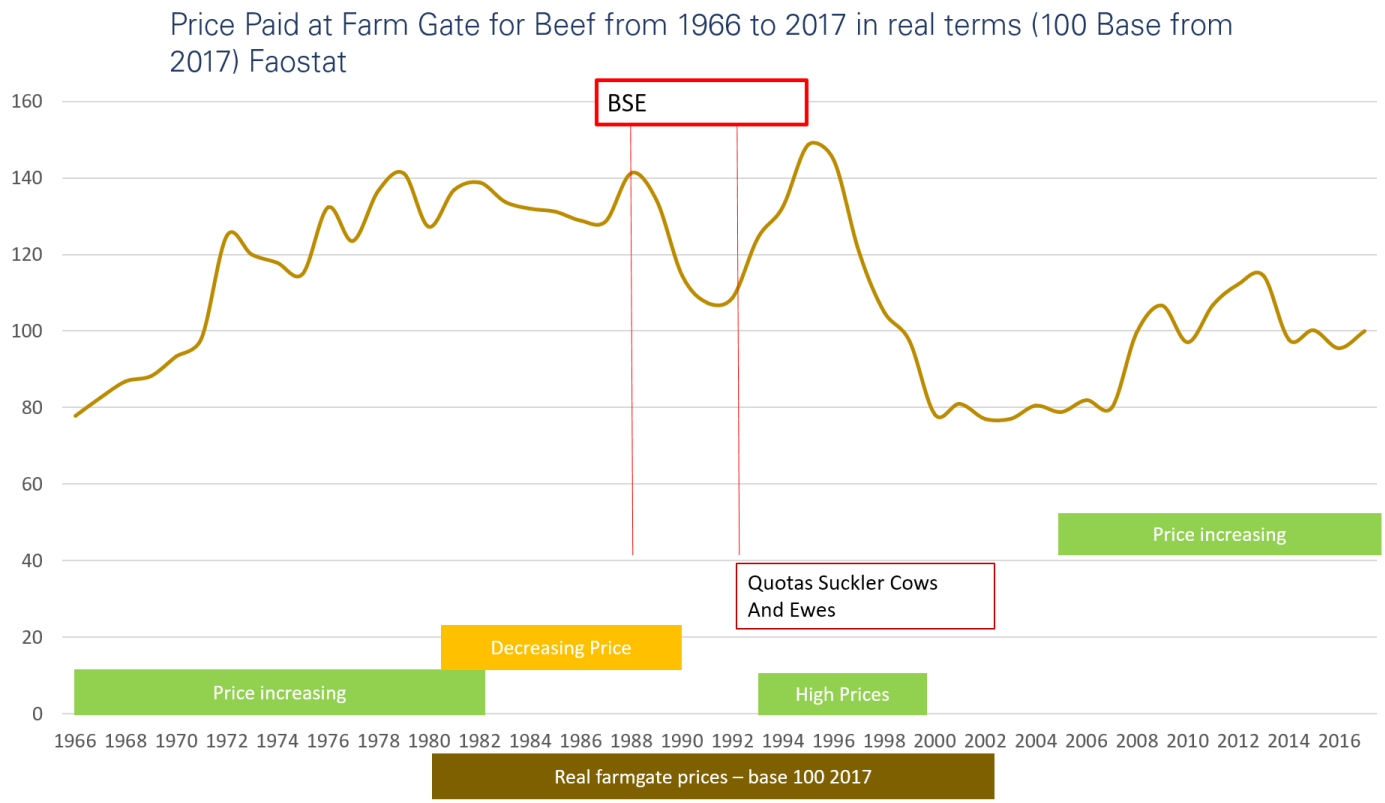


Cleaned and cured ditch near roads if there is room enough

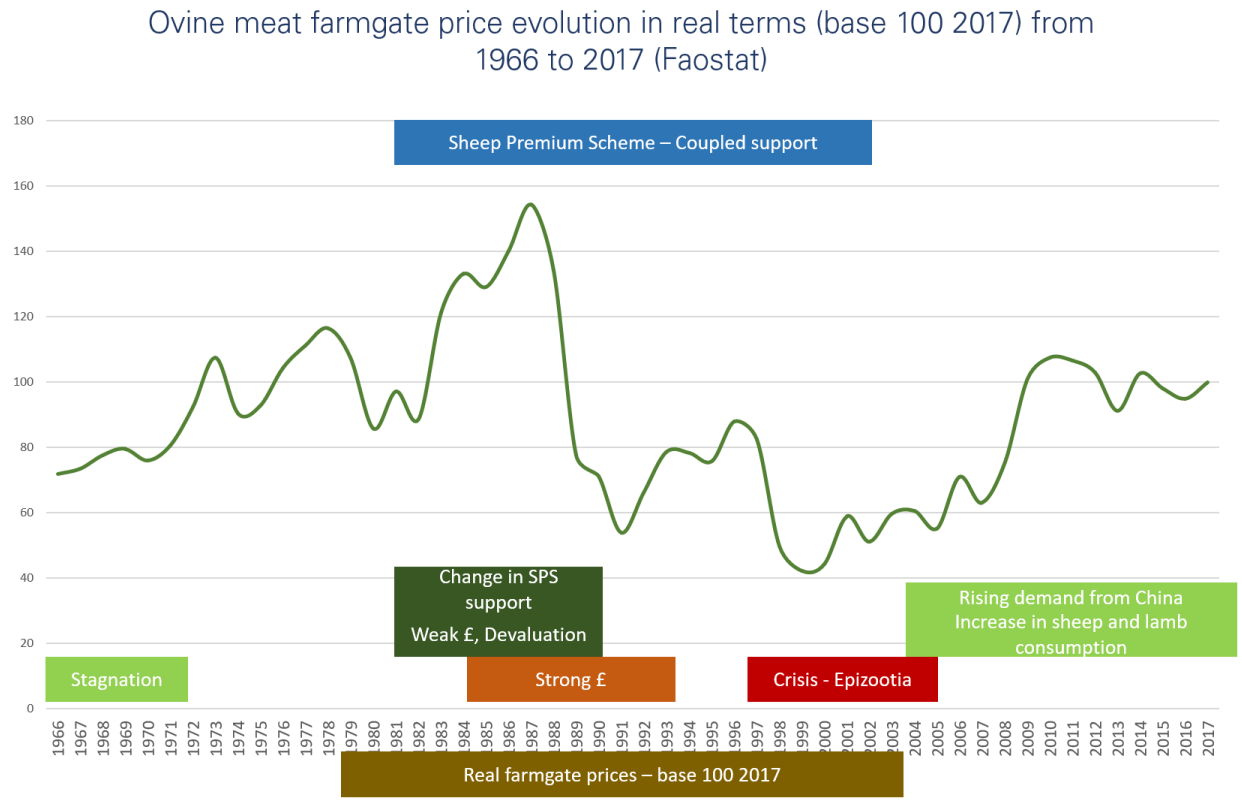
Appendix 12: Structure and building of a Pembrokeshire hedge. The structure of bushes and trees constuting the hedge are enthralled in the base of the hed (LT from interviews and fieldwork)



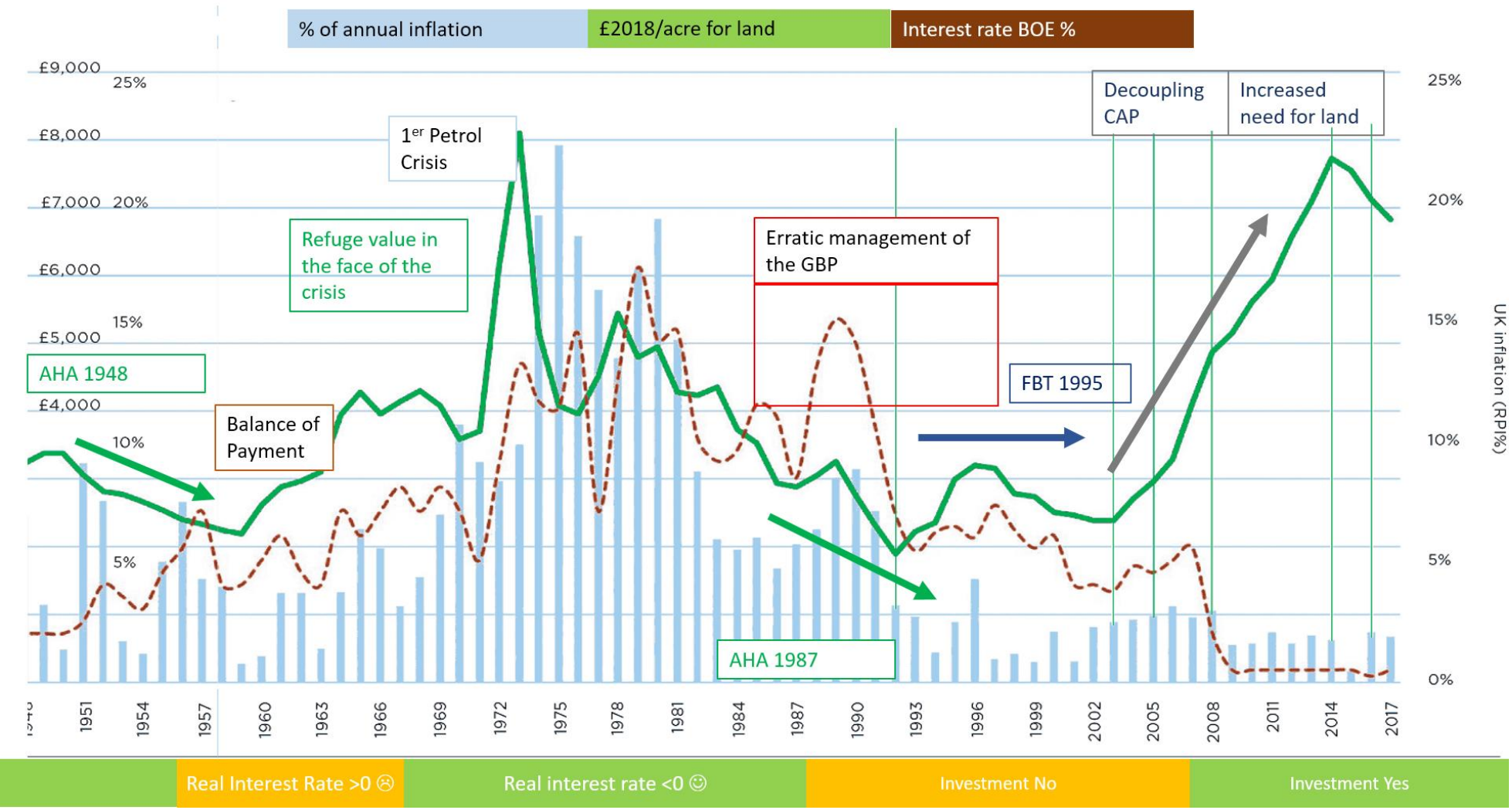
Appendix 13: Farmgate price paid to the farmers for milk from 1966 to 2000 with an analysis on the context (FaoStat – LT)



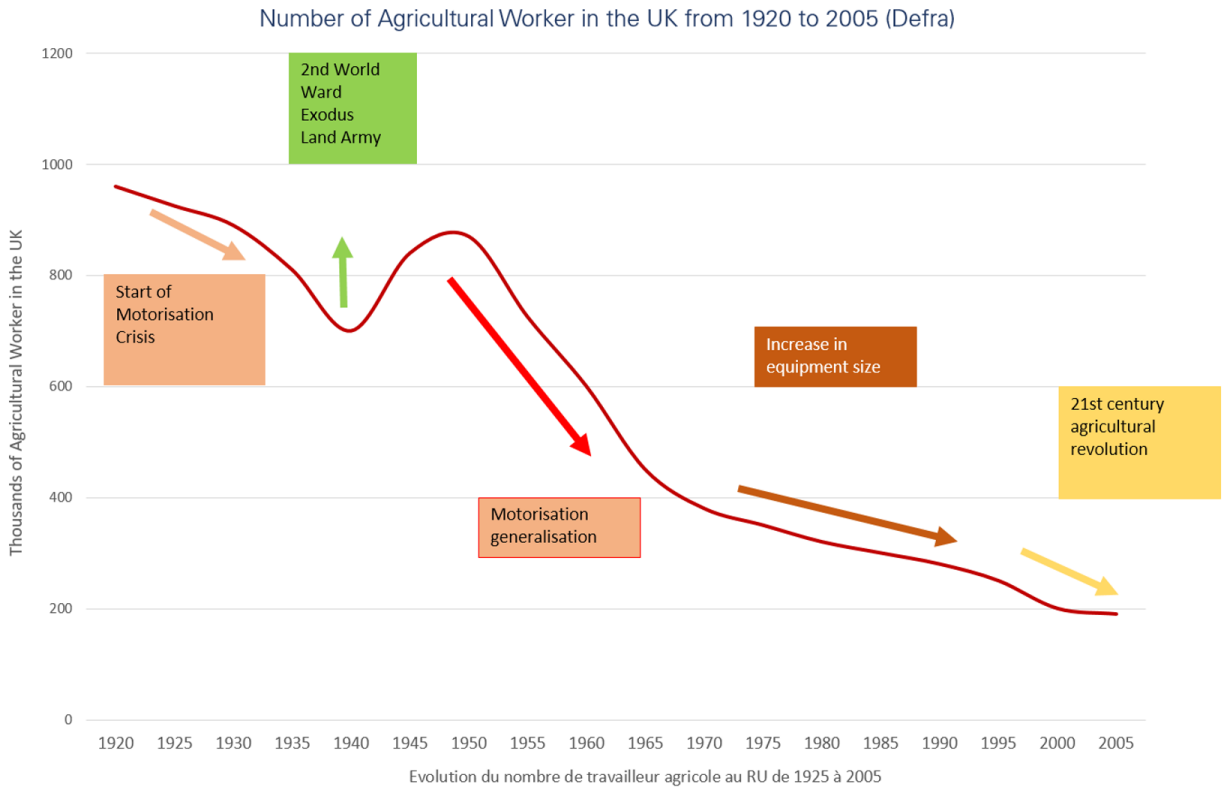
Appendix 14 : Farmgate price evolution in the UK from 1966 to 2017 on bovine meat (Faostat – Analysis LT)



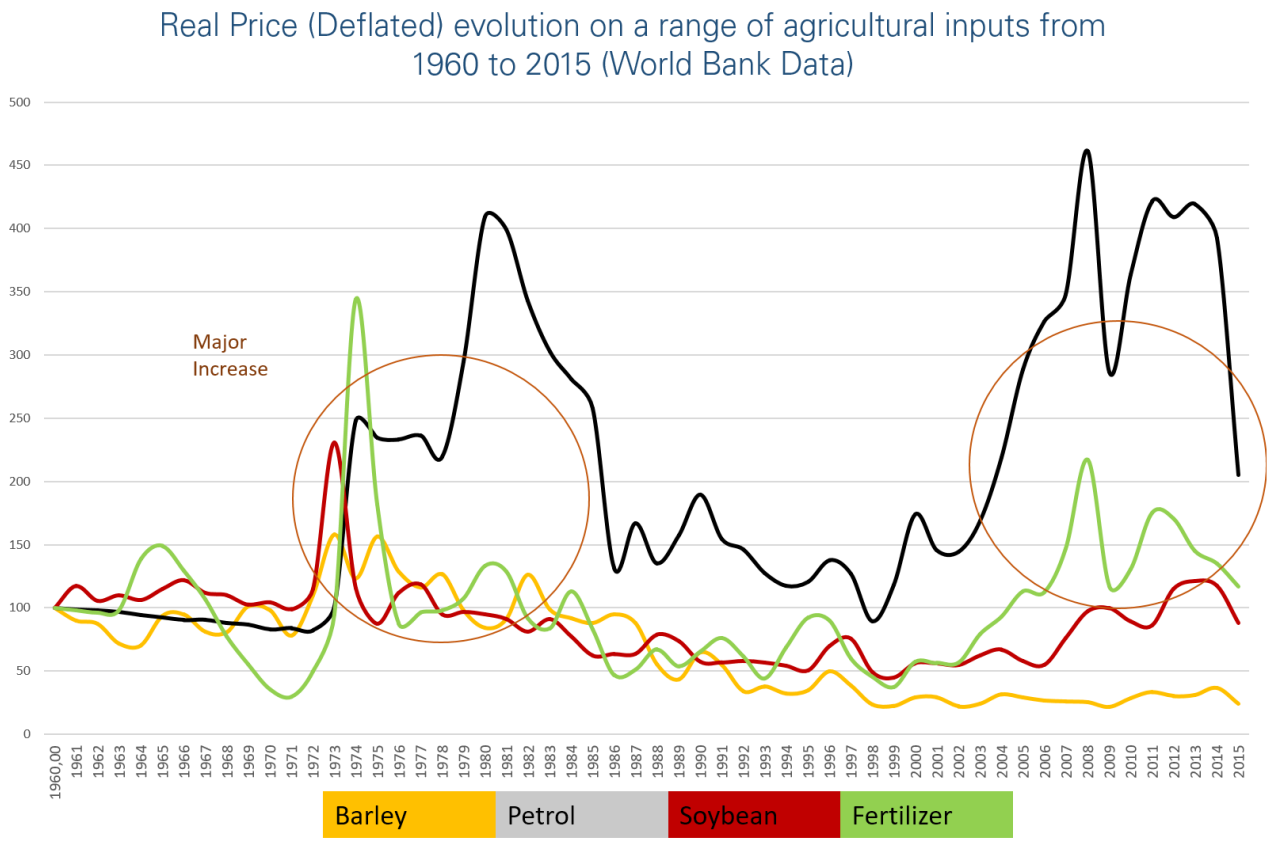
Appendix 15: Farmgate price evolution in the UK from 1966 to 2017 on ovine meat (Faostat – Analysis LT)



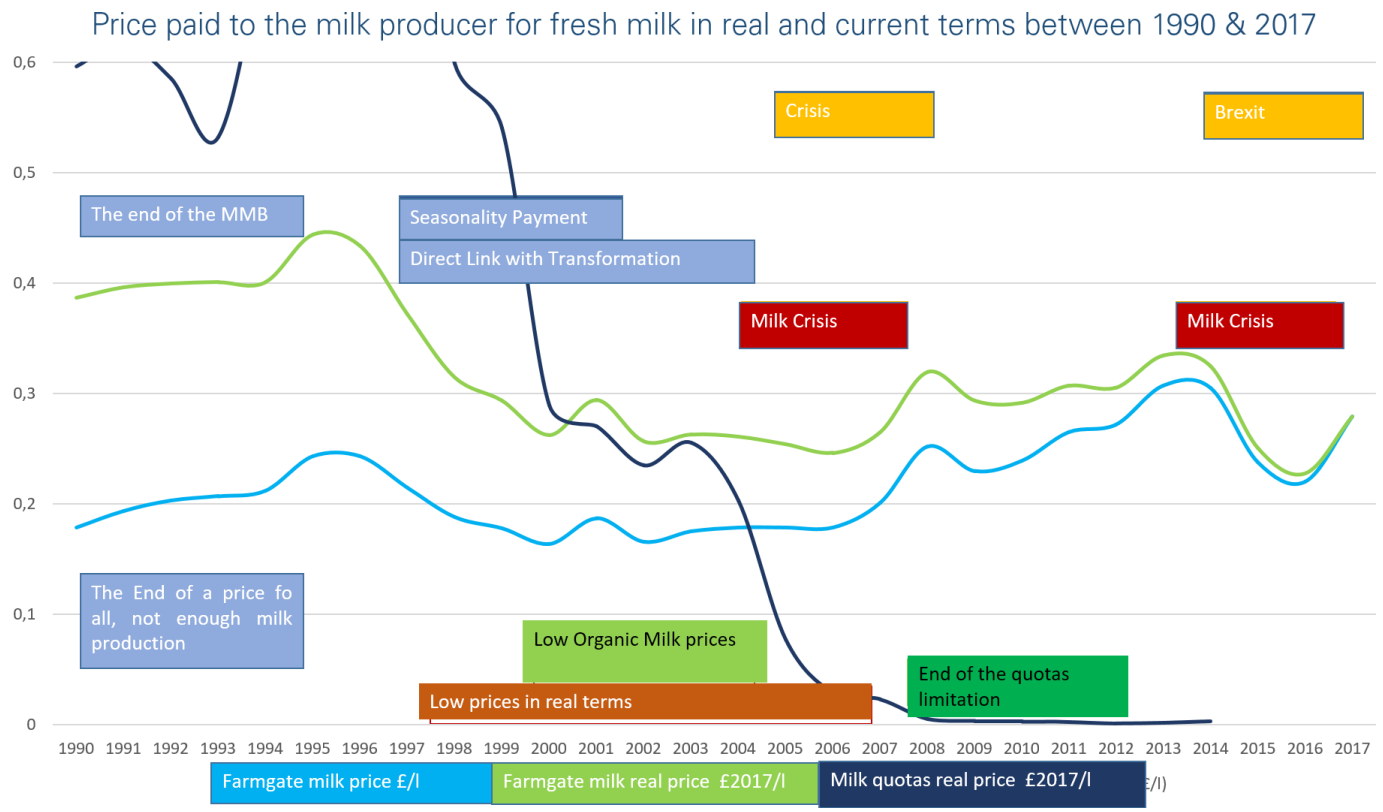
Appendix 16: Evolution de l'inflation annuelle, du prix moyen des terres agricoles et du taux directeur de la livre sterling, contexte économique global (Savills Research 2017, interprétation LT)



Appendix 17: Work productivity evolution through the decrease in Agricultural Worker in the UK from 1920 to 2005 (Defra – Analysis LT)

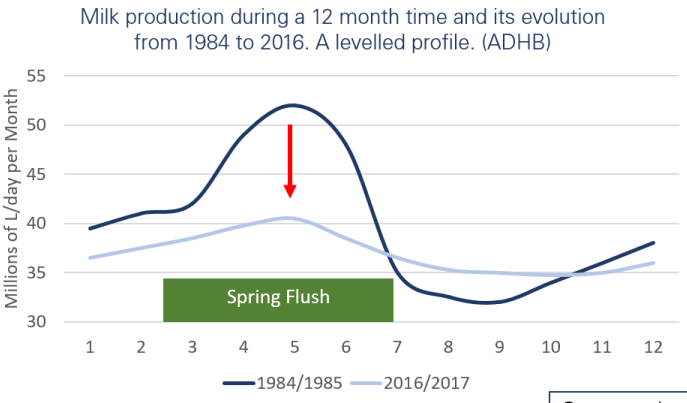


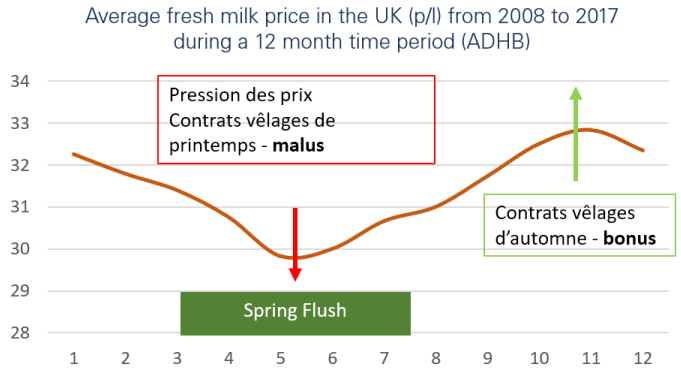
Appendix 18: Real price evolution for a range of agricultural inputs from 1960 to 2015 (World Bank Data) (Base 100 1960)



Appendix 19: Farmgate price evolution for milk between 1990 & 2017 (current and real terms compared to quotas price evolution (Defra)

Milk industry profile evolution (ADHB):





Liquid Milk Contract

Transformation Milk Contract

Cooperative transformation– 28-29p/L (First Milk)

« Milk Brooker » 26-27p/l (County Milk)

Transformation – 28-29p/l (Glanbia/Müller)

Spring Cont– 4/6 p/l

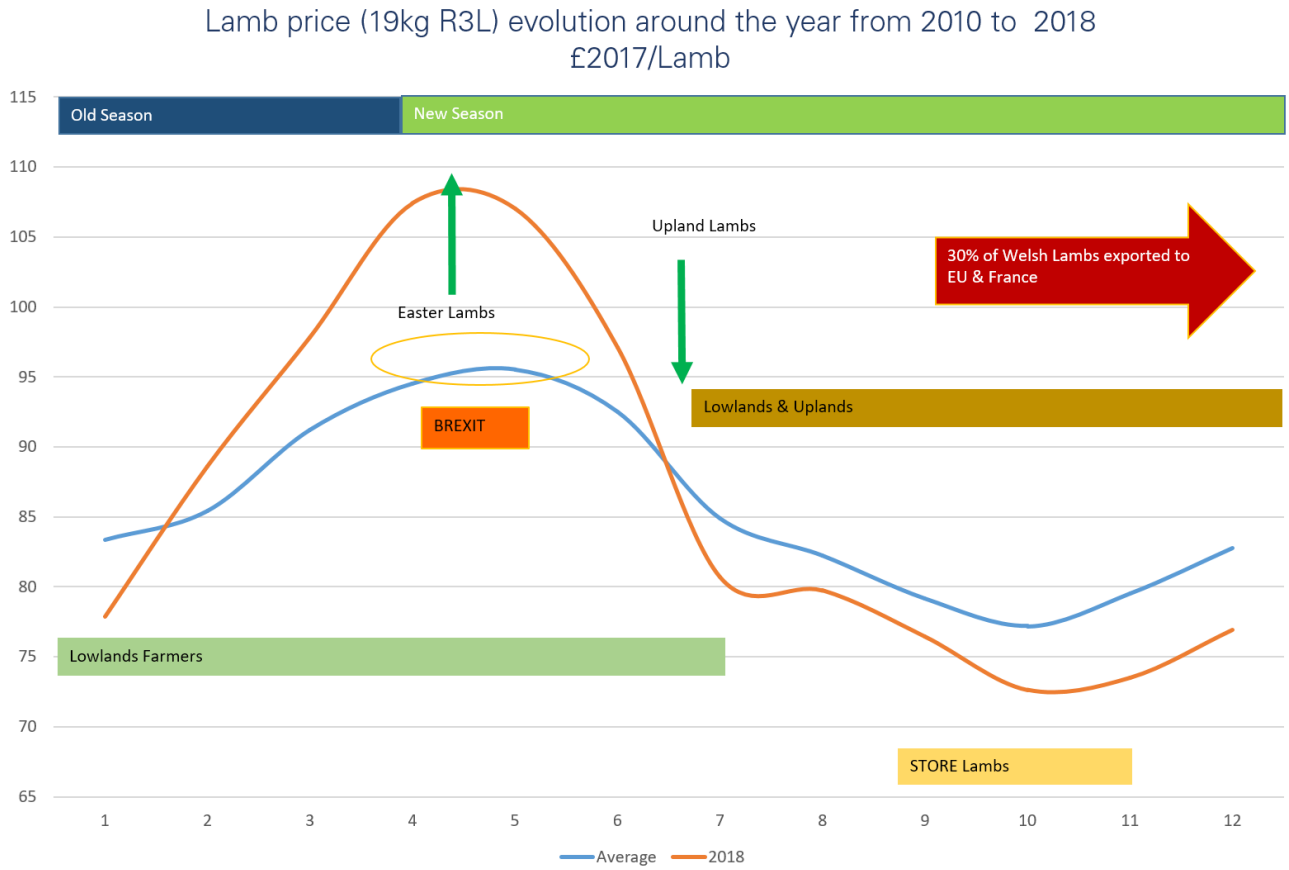
Autumn + 2 p/l

Organic Milk + 10 p/l

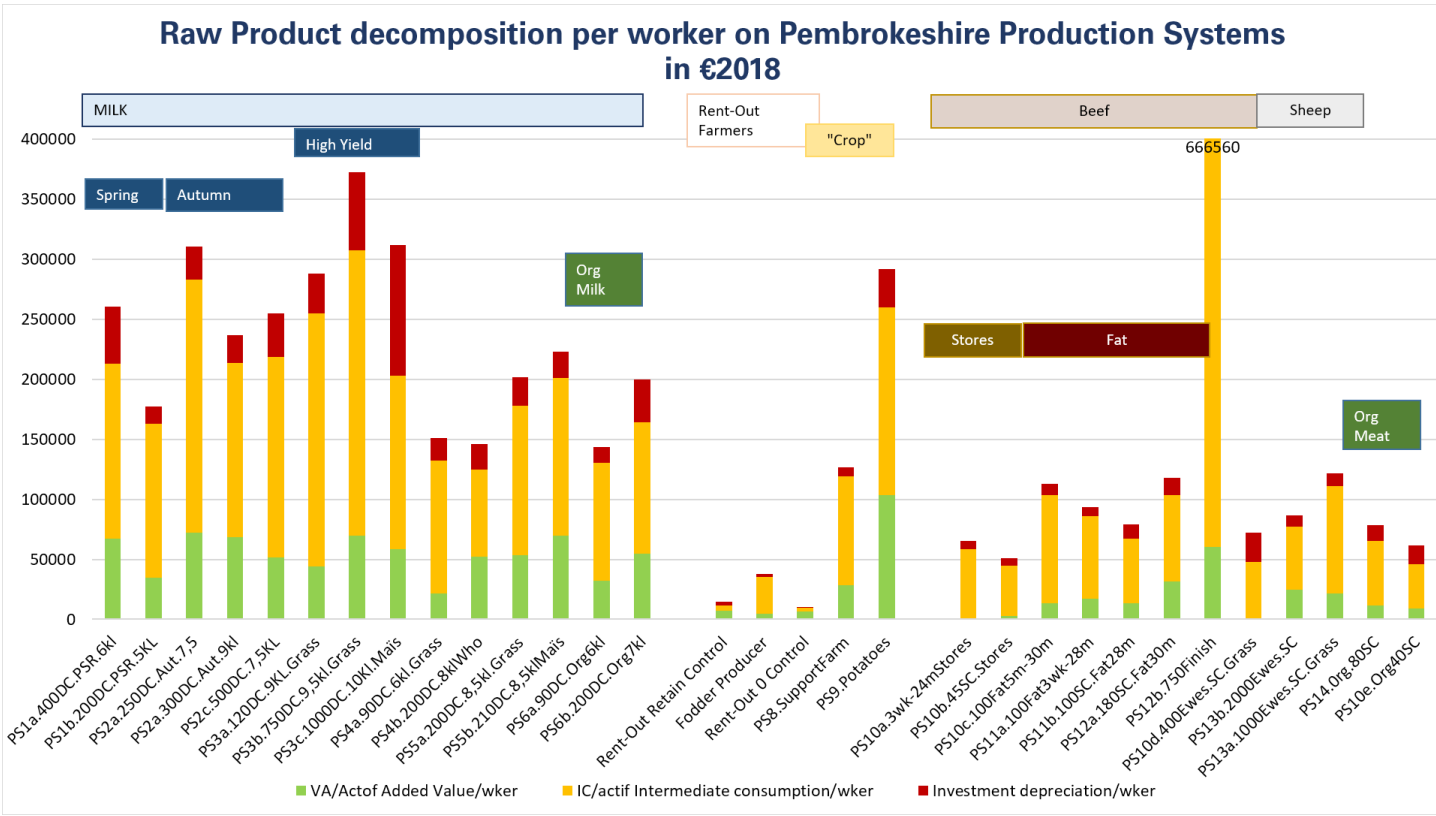
Tesco Cheese +1/2 pL

+/- Volume Payment +/- Production evolution Payment +/- milk quality standards

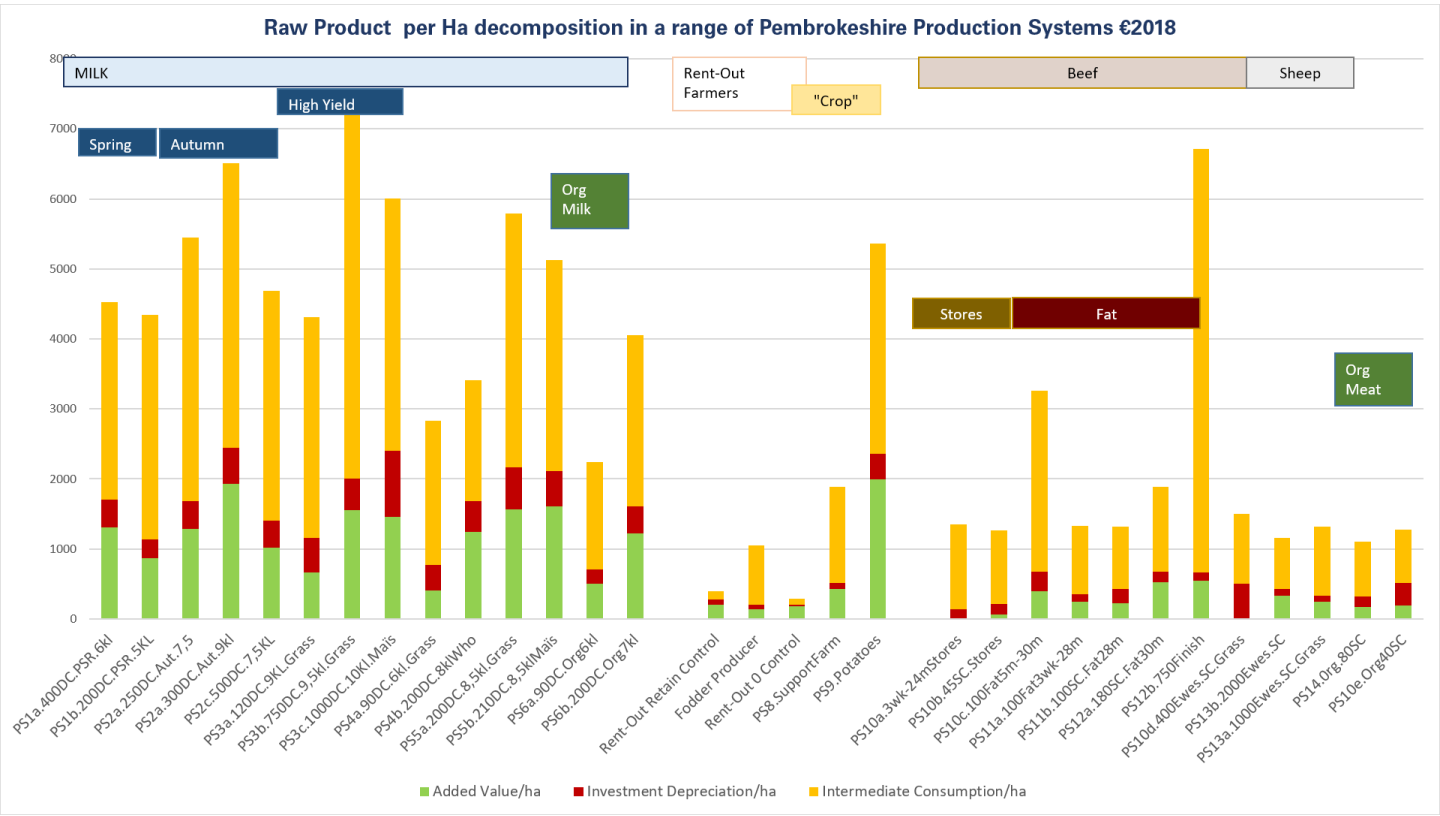
Appendix 20: Milk price farmgate profile (ADHB & Farm Interviews) evolution from 1984 to today



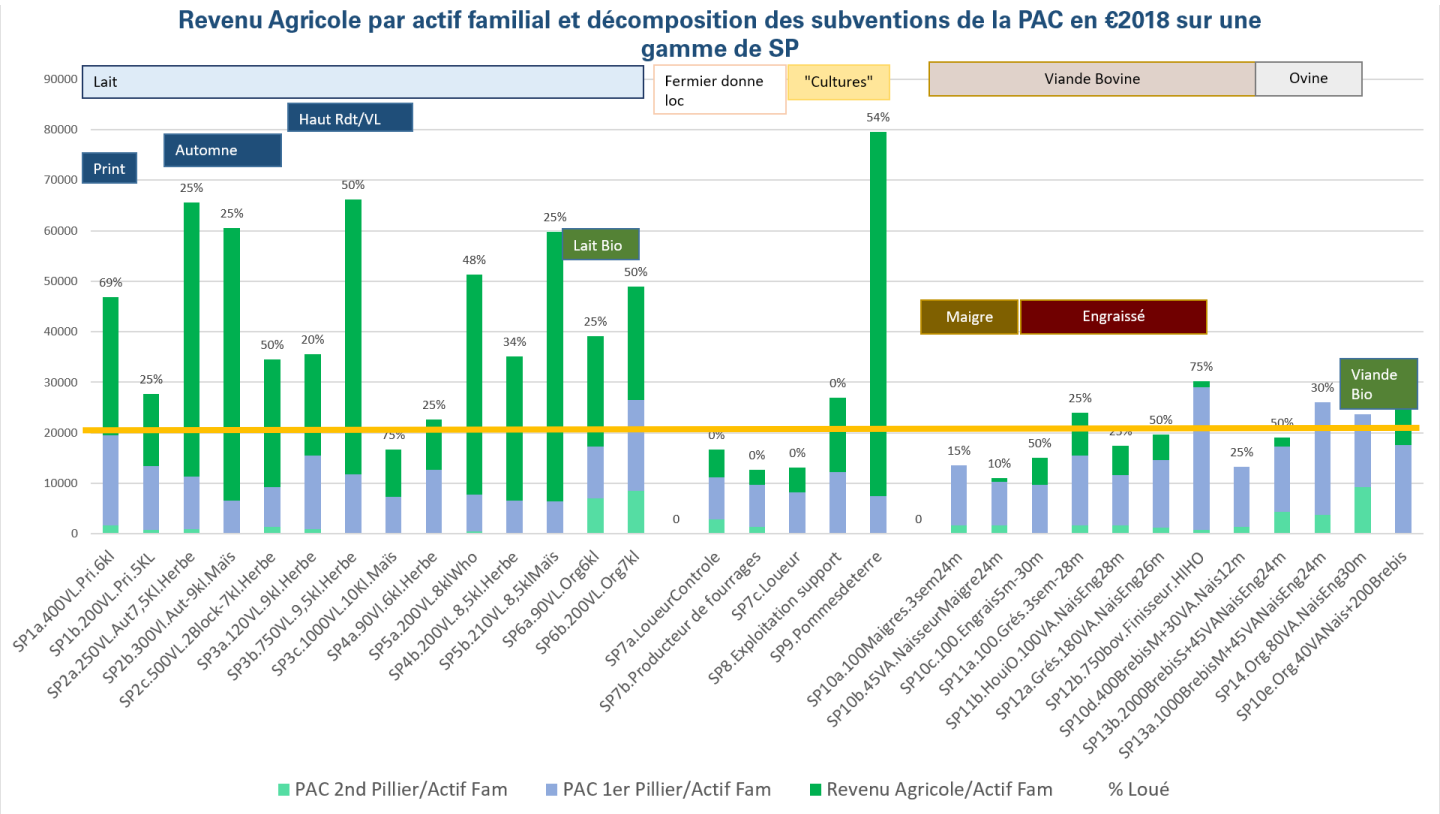
Appendix 21: Farmgate price evolution for lambs in 2018 and average from 2010 to 2018 in £2017 (ADHB & Defra – Analysis LT)



Appendix 22:

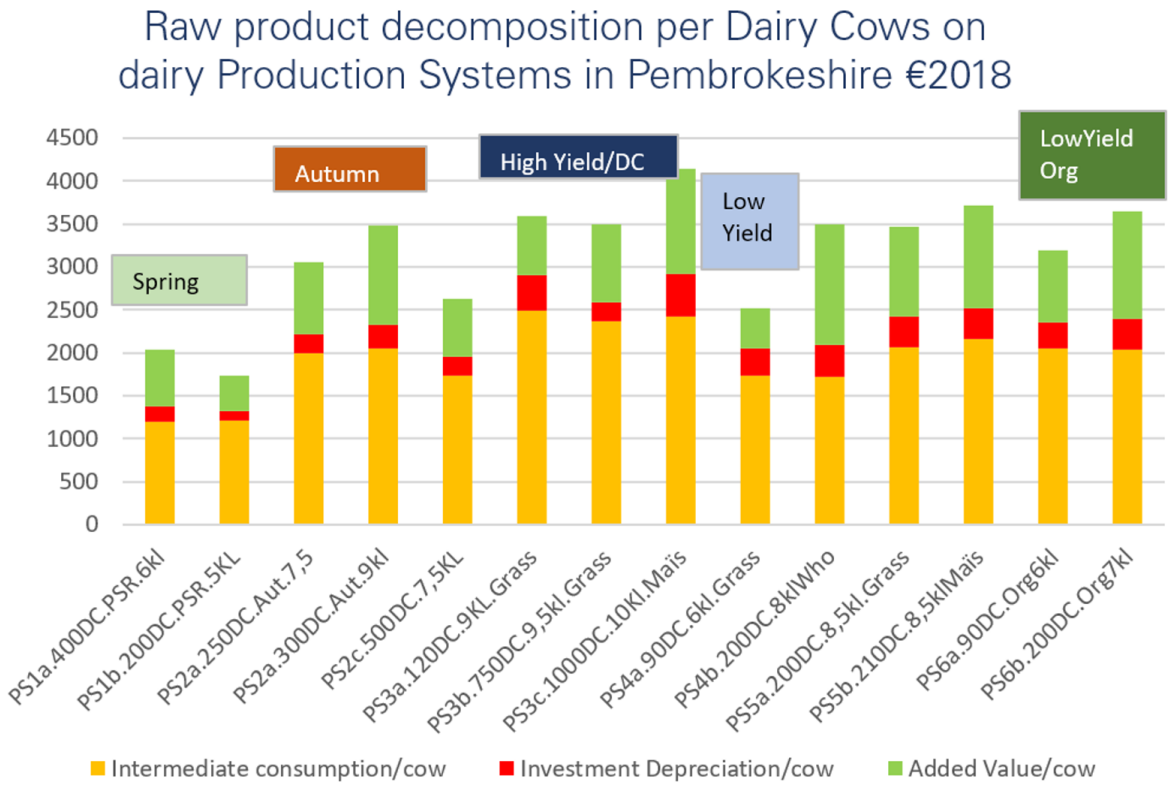


Appendix 23:

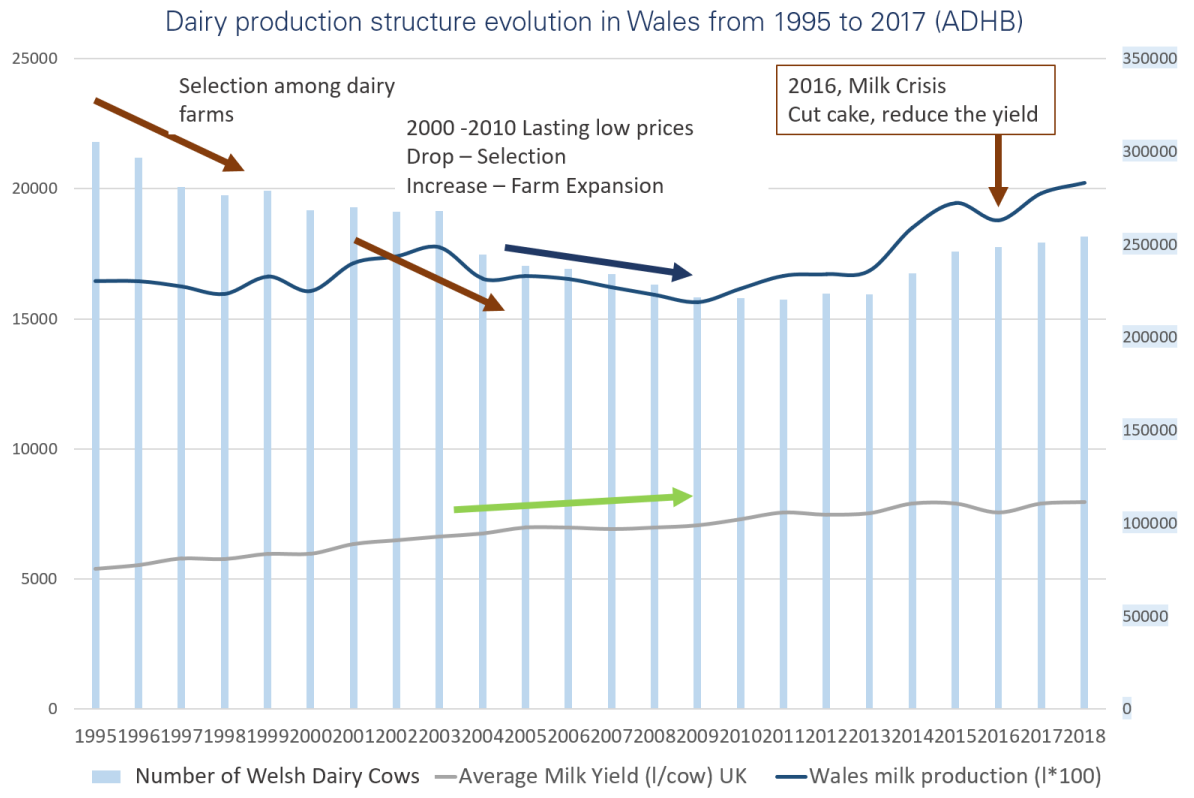


Appendix 24:

Living wage in the UK – 20K€



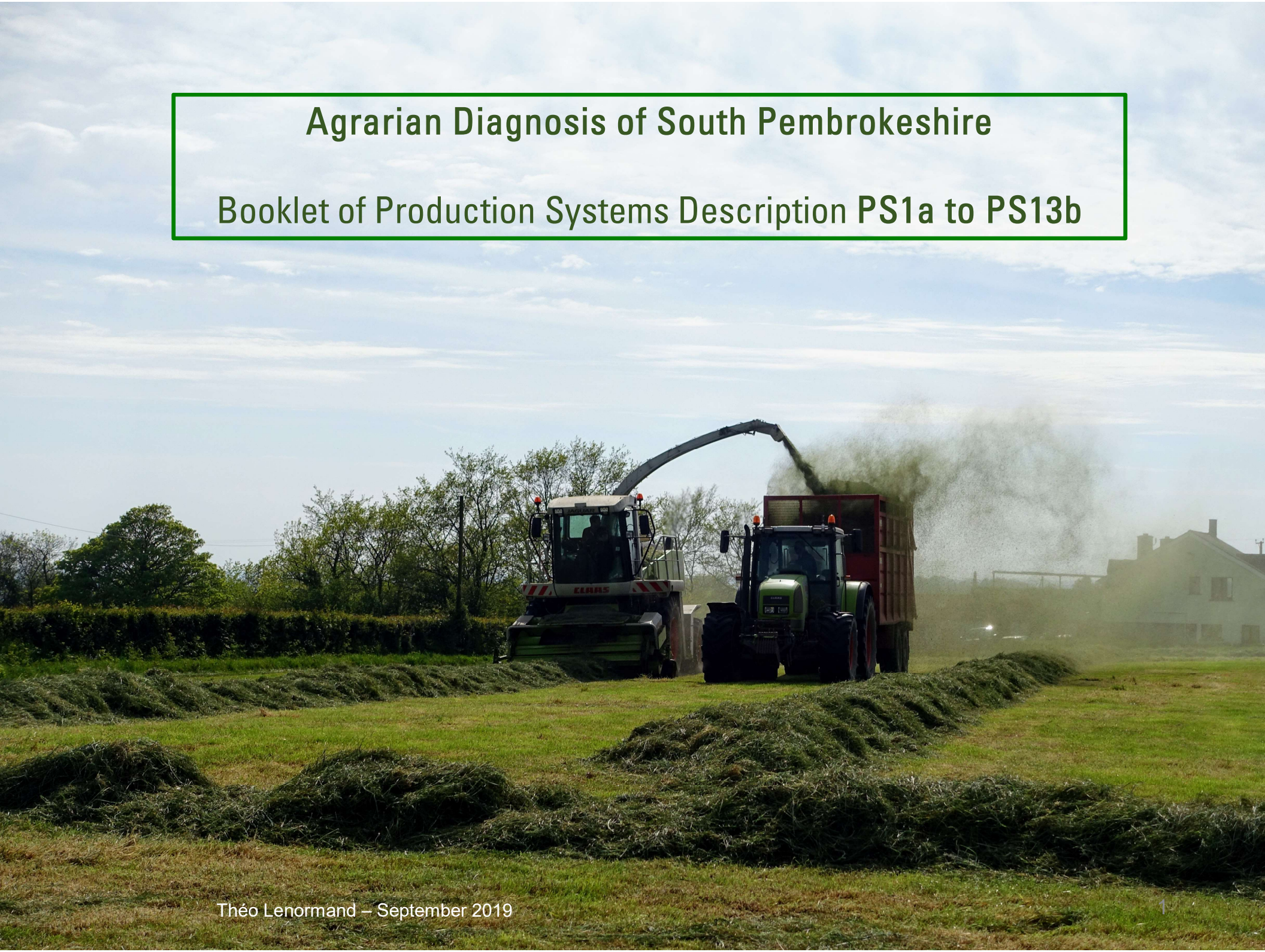
Appendix 25:



Appendix 26:

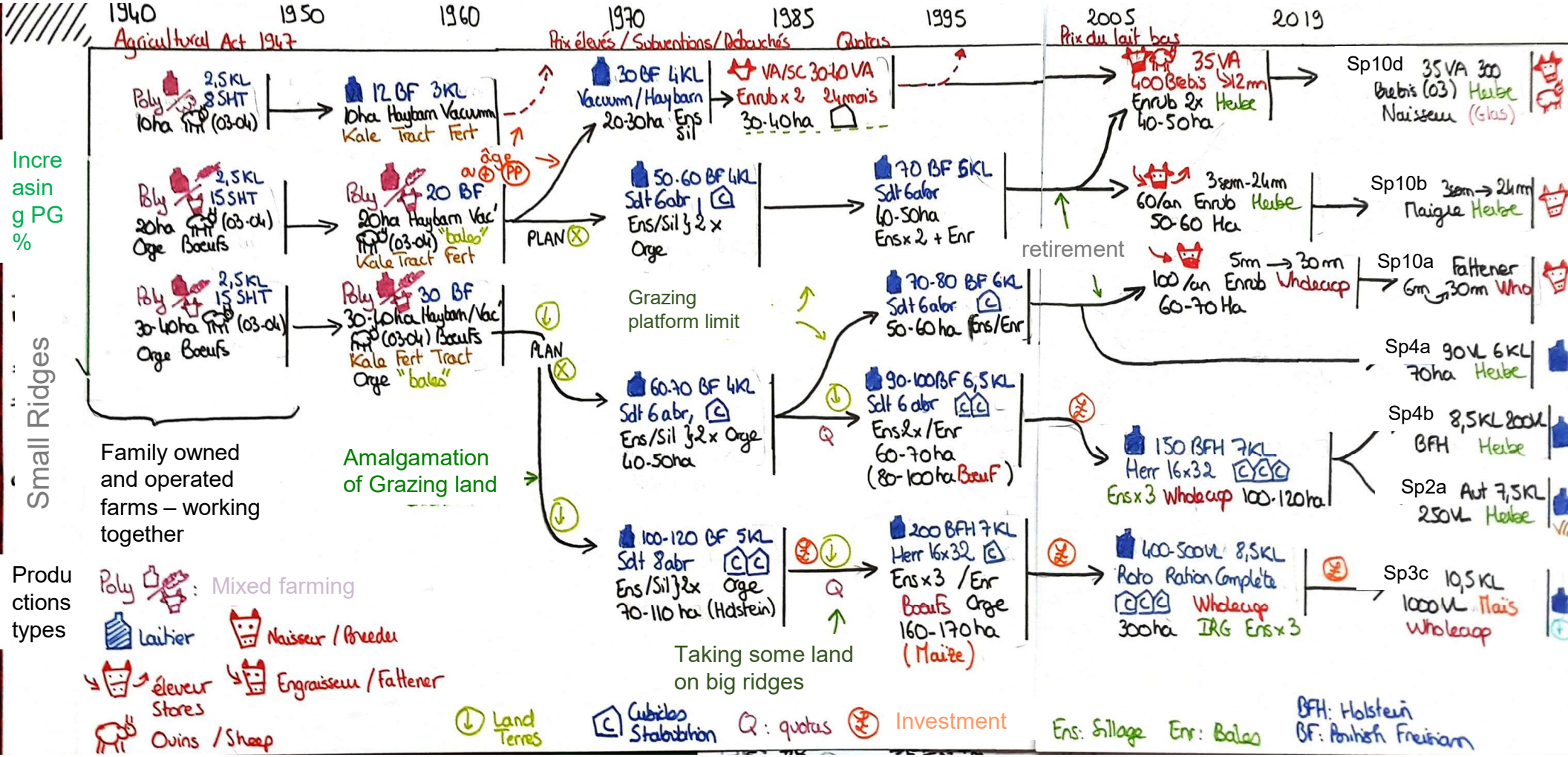
Agrarian Diagnosis of South Pembrokeshire

Booklet of Production Systems Description **PS1a to PS13b**

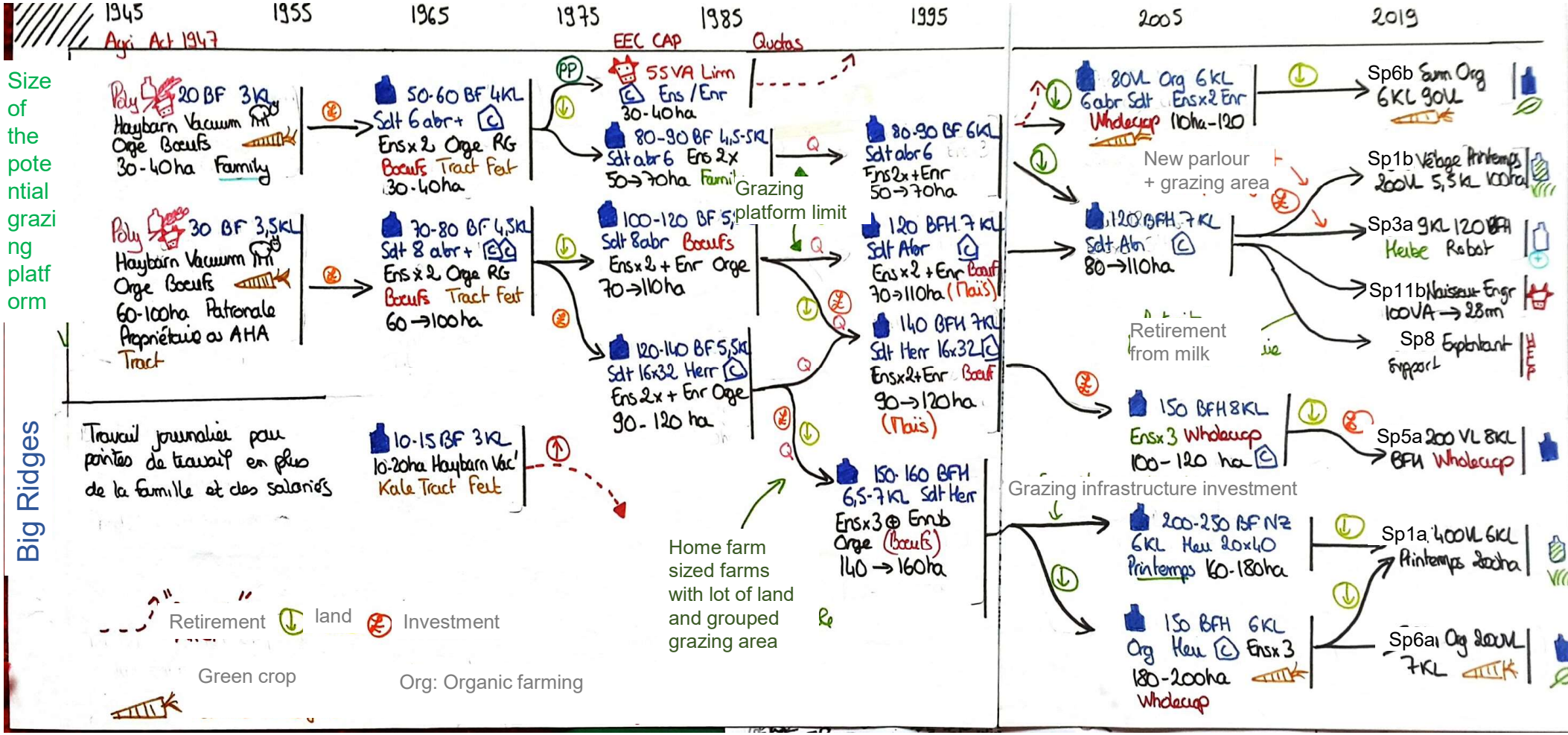


Théo Lenormand – September 2019

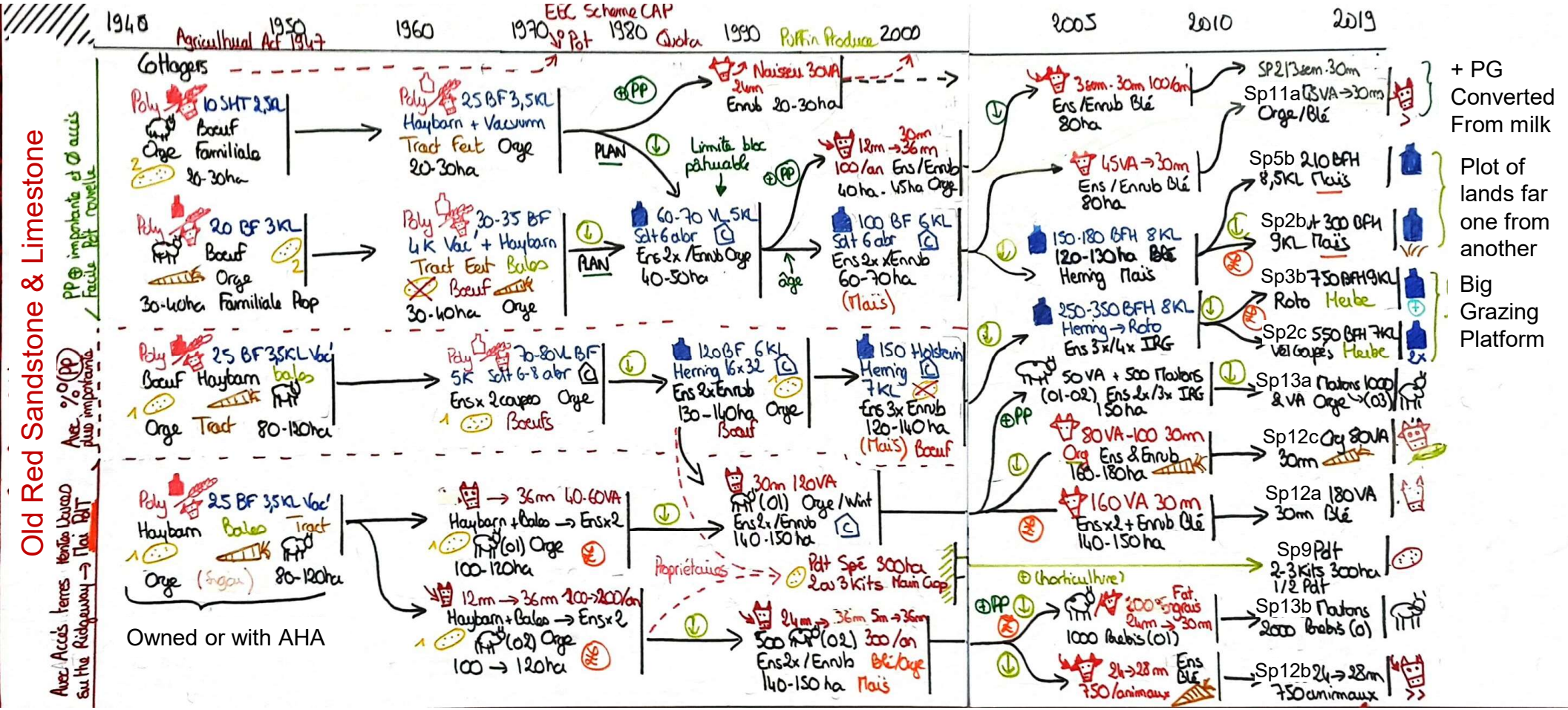
Evolution of Production Systems on Small Ridges



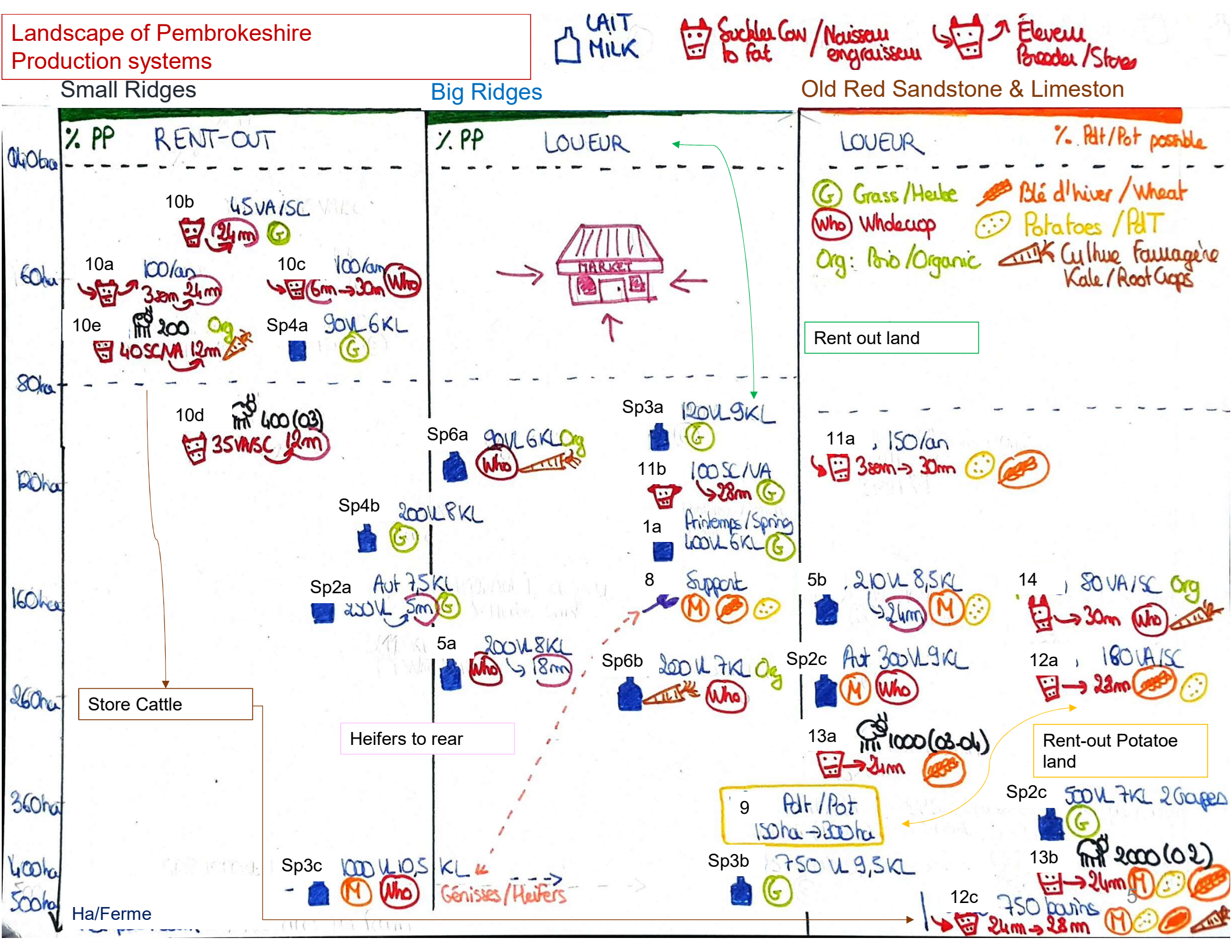
Evolution of Production Systems on Big Ridges



Evolution of Production System on big ridges
Old Red Sandstone & Limestone



Landscape of Pembrokeshire
Production systems



PS1a: DC Spring Calving 6 KL for 400 DC Grass only, Big Ridges

- 450a (70% Rented) → 180-200 Ha
- 350-450 VL – AHA et FBT
- 1 Fam + 2Wker 90% Ploughable
- 90% Ploughable
- 05% PP
- 05% PP Slopes

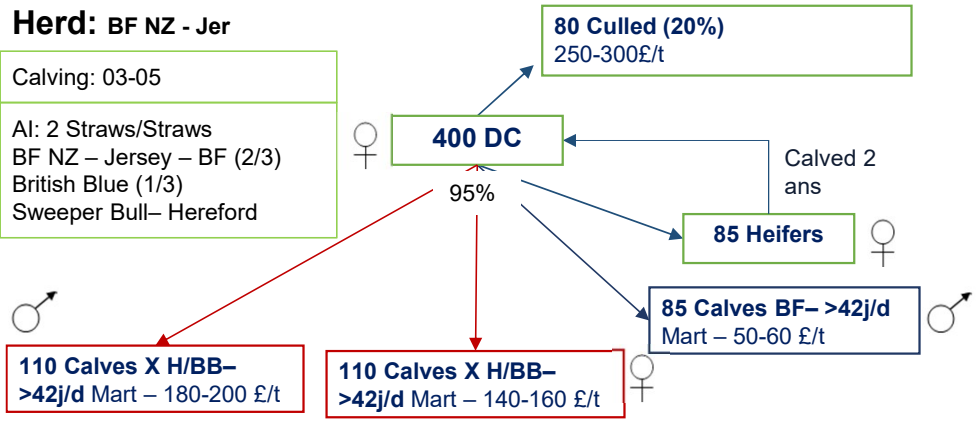
Equipment:

- Stabulation libre/Cubicles 400 (Sable) + Straw
- Slurry Pit 1m°gal 3m
- Herr 25*50 ('Automatic')
- 2 tractors with FL(100-120 cv)
- 1 Telescopic 1 Skidsteer
- Mower, FertiSluer, Slurry tanker, Quad
- Grazing Infra (Track et paddock)

Herd: BF NZ - Jer

Calving: 03-05

AI: 2 Straws/Straws
BF NZ – Jersey – BF (2/3)
British Blue (1/3)
Sweeper Bull– Hereford



Milk:
5,5 -6 KL/DC
Spring: Fat: 44g/L Prot: 38 g/L – 22p/L
Summer: Fat: 49g/L Prot: 4g/L - 30p/L

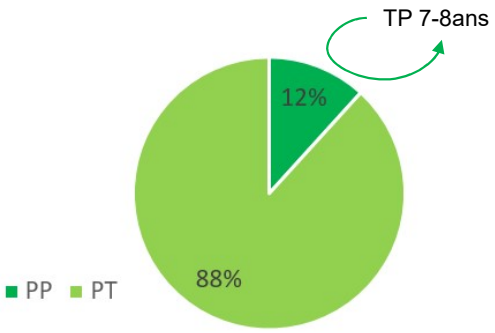
Tack Sheep: 200 Ewes with 65p/head/week from 11 to 02

Lime: 1/ 4 yeat

Diet:

Month	01	02	03	04	05	06	07	08	09	10	11	12
Dairy Cow	Dry		18% 6kg	Parlour cake - 16% P 5kg						Parlour - 18% P 5 kg		
	Silage 30kg (27%MS) Minerals 100g		Grazing 65 kg (15% DM) (Transition 2 sem Sillage 15kg)								Silage 40kg (27%MS)	
			↑Veaux X viands ↑ Beef X Calves									
Calves			Colostrum 5d Milk Calf pellets & Straw			Grazing (15%DM) Calf pellets					Bales 15 kg 1kg cake 18%	
Heifers 1 Heifers 2	Bales 15 kg 1kg cake 18%		Grazing								Bales 22kg 2kg cake 19%	

Fodder production: 180ha



Mois	01	02	03	04	05	06	07	08	09	10	11	12
PT - TP Resemé/Reseeded	6ha							Herb	Fm Slu Prep + S			
RG + WC Long term 5-7 ans. Epiaison tardive	60ha pour sil et bales		Slu	Fert 50U	Sil Slu/Fert	Sil 5	Slu/Fert	Sil 5 (Fert)	(Bales 3)	Fm		
					50U		30U					
RG + TB 5-7 yr 15T MS/ha/an	100ha **Paddock 12h**	Slu	Tran Fert	Fert 30U 30d	Fert 30d	Fert 30d	Fert 25U/Top 21d	30d	Fert 25U 30d	Tran Slu	Slu	
PP Grazing Gênisses/Youngstock	16ha 3*/m		Fert		Fert		Fert/Top		Top?			

2,8 UGB/ha

PS1a.PRI.6KL	€ 2 018		€ 2 018
Raw Product/DC	2039	Added Value/Actif	67471
Intermediary Consumption/DC	1270	Subsidies (Glastir)	38998,8
Added Value/DC	590	Agricultural Revenue per family worker	46883
		Subsidies % AR	42%

PS1b: DC Spring Calving 5,5 KL for 200 DC Grass only, Big Ridges

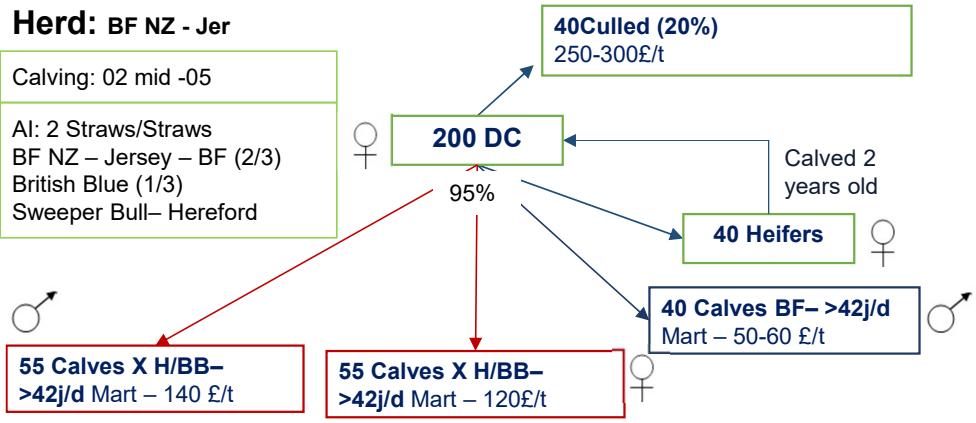
- 150a-250ha (25% rented)
- 150-250 DC– 80-100ha
- 1,5 Fam + 0,5 ETP

- 90% Ploughable
- 10% PG humid
- 0% PG sloppy

Herd: BF NZ - Jer

Calving: 02 mid -05

AI: 2 Straws/Straws
BF NZ – Jersey – BF (2/3)
British Blue (1/3)
Sweeper Bull– Hereford



Milk:
5,5 KL/DC
Spring: Fat: 44g/L Prot: 38 g/L – 24p/L
Summer: Fat: 49g/L Prot: 4g/L - 29p/L

Equipment:

- Cubicles (sawdust) + straw loose housed
- Slurry Pit 250Kgal 3m
- Herr 16*32 + Bulk tank 10KL

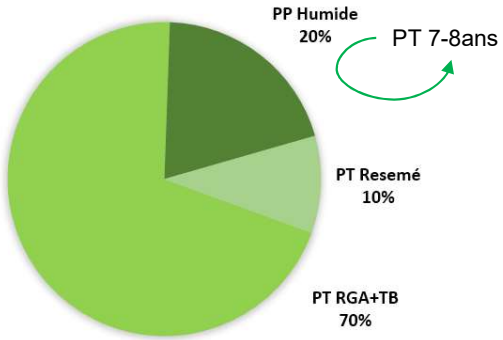
- 2 tractors with FL (100-120 hp)
- 1 JCB1 Skidsteer
- 1 part haykit, Fertilizer spreader, Slurry tanker
- Quad
- Grazing infrastructure (paddock,..)

Diet :

Month	01	02	03	04	05	06	07	08	09	10	11	12
Dairy Cow	Dry		18% 6kg	Parlour cake - 16% P 5kg						Parlour - 18% P 5 kg		
	Silage 30kg (27%MS) Minerals 100g		Grazing 65 kg (15% DM) (Transition 2 sem Sillage 15kg)								Silage 40kg (27%MS)	
			↑Veaux X viands ↑ Beef X Calves									
Calves			Colostrum 5d Milk Calf pellets & Straw			Grazing (15%DM) Calf pellets					Bales 15 kg 1kg cake 18%	
Heifers 1 Heifers 2	Bales 15 kg 1kg cake 18%		Grazing								Bales 22kg 2kg cake 19%	

Lime : 1/4ans

Fodder production : 80ha



Month	01	02	03	04	05	06	07	08	09	10	11	12
TG - TP	8ha							Sp	Fm Slu Prep + S			
RG + WC Long term 5-7 year.	30ha Sillage et enrub		Slu	Fert 50U	Sil 7 Slu/Fert	Sil 5	Slu/Fert	Sil 5 (Fert)	(Bales 3)	Fm		
Late perennial varieties RG + WC 5-7 yr 15T MS/ha/an					50U		30U					
	44ha Paddock 12h	Slu	Tran Fert	Fert 30U 30d	Fert 30d	Fert 30d	Fert 25U /Top 21d	30d	Fert 30d	Tran Slu	Slu	
PG Grazing Youngstock 8T MS/ha/an	8ha 3*/mois		Fert		Fert		Fert/Top		Top?			

3 LCU/ha

PS1b.SPRI.5KL			€2018
RP/DC	1845	AV/Wker	27778
IC/DC	1283	Subsidies tot	20102
AV/DC	347	Agri Revenue/ Fam Wker	27728
		Subsidies in % of AR	36%

PS2a: Autumn Calving with 250 DC producing 7,5KL on grass on small ridges

General:
- 200-300 VL
- 330 → 400a (25% Rented).
- FBT
- 1 ETP + 2 Farm
- 10% Non Ploughable PP humide

Equipment:
- herringbone 16x32 ACR/SO . Bulk tank 10KL
- Cubicle shed (Sawdust + Mat) ⊕ loose housing
- Tract 2 (120, 150) . JCB . Feat Drill
- 1 pat hayfit . Quad . Scapper
- Slurry pit 1700 gal

Herd: BFH X Milk 7,5KL ß 4,3 P 3,5 First Milk Cheese 28-29 p/P

Autumn Block 08 → 11

(AI) BFH 1/3 BB 2/3 2,5 Straw

Heifers ½ BFH sexed

Sweeper Bull AA

250 DC → 50 Culled 450£

↑ 2yr 50 ♀

70 ♂ X BB 450£ 6-7m Mart 400£ Cast

20 ♀ <42jd Mart 130£

30 ♂ BFH <42d Mart 50£

30 ♂ X BB 160£ <42d

40 ♀ X BB 140£ <42d

Diet:

	01 02 03 04 05 06 07 08 09 10 11 12
Dairy Cows	Silage 45 kg grass 7,5kg cake 18% / GRASS 60kg 4kg cake 16% / Silage 8kg Gra GRASS 7kg cake 16% / ...
Dry Cows	dry precaving / GRASS 2kg cake 16% 1kg straw / Silage 20kg 2kg cake
Calves	colostrum → milk powder calf pellet 1,5 kg straw
>8wk	haylage 5→8kg pellets 2kg / grass cake 1kg / haylage 12kg cake 1,5kg
Heifers	haylage 15kg pellet/cake 2kg straw / GRASS / Silage 20kg cake 1kg

Acreage: 350a

285a PT RGA + WC

35a PP humide

30a Reseeded PT RGA + WC

Silage Guard: 160a 1x) 2x) 80a 3x) 4x)

Grazing Platform 85a → 130a ⊕ Spring Aut

PT RGA+WC GRASS 10yr

TS 180 200 Ewes 10 → 02 65p/wk PP

Fodder

	01 02 03 04 05 06 07 08 09 10 11 12
	← Lime 2T/a 1/4yr
Reseeded	Herb Plant ... TS / Furrow S1
Silage Guard	S1 S1 Ens Ens Bales Bales 24d
Grazing Plat	40d 2d paddock 1day Top/Herbs Dry cows follow S1 S1
	Set Stock 1-2 week 30d Relax Top/Herbs

PS2b: Autumn Calving with 300 DC at 9KL with Maize on Big Ridges

General: • 400-500a (25% Rented) • 10% PP pente & humide • FBT • 200-350 VL • 90% Ploughable • 3,5 ETP + 1,5 Farm

Equipment: • Rotary 40-50 pt ACR one man. Bulk tank 10Kl • Cubicle shed → Woodchip ⊕ loose housing • Tract 2 (130, 120) • JCB • TMR-Wagon Mixer • 1 part haykit • Quad • Trailers • skidsteer • Slurry Pit 2 MGal (Tower)

Head: BFH 9 KL ♂ 4,3 ♀ 3,4 Brooker 27-28 p/P

Autumn Block 09→12

AI 2,6 Straw Sexed
BFH 1/3 BB 2/3
1,7 Straw Heifers
BFH Sexed
Sweeper AA 1/yr

300 VL/DC → 60 Culled 700£
95% → 2yr → 60 ♀ BFH
→ ♂ 30 BFH <42j → 45£ Mart
← 100 ♂ x BB <42j Contract 150£
← 100 ♀ x BB <42j Contract 120£
TS 600 E 65p/wk 10mid → 12-01

Acreage: 400a

- 30a PP humide
- 70a Maize
- 100a IRG
- 200a RG + WC

Maize (w/a 2x) → IRG 3yr → RG+WC 7-8yr

Grazing Platform 120a
Other stock 10-20a

Silage 180a 1x) 2x) 100a 3x) 50a 4x)

19T Maize 30% Silage
Silage Ground 18T 28% DM
Grazing Platform
Other Past (PP)

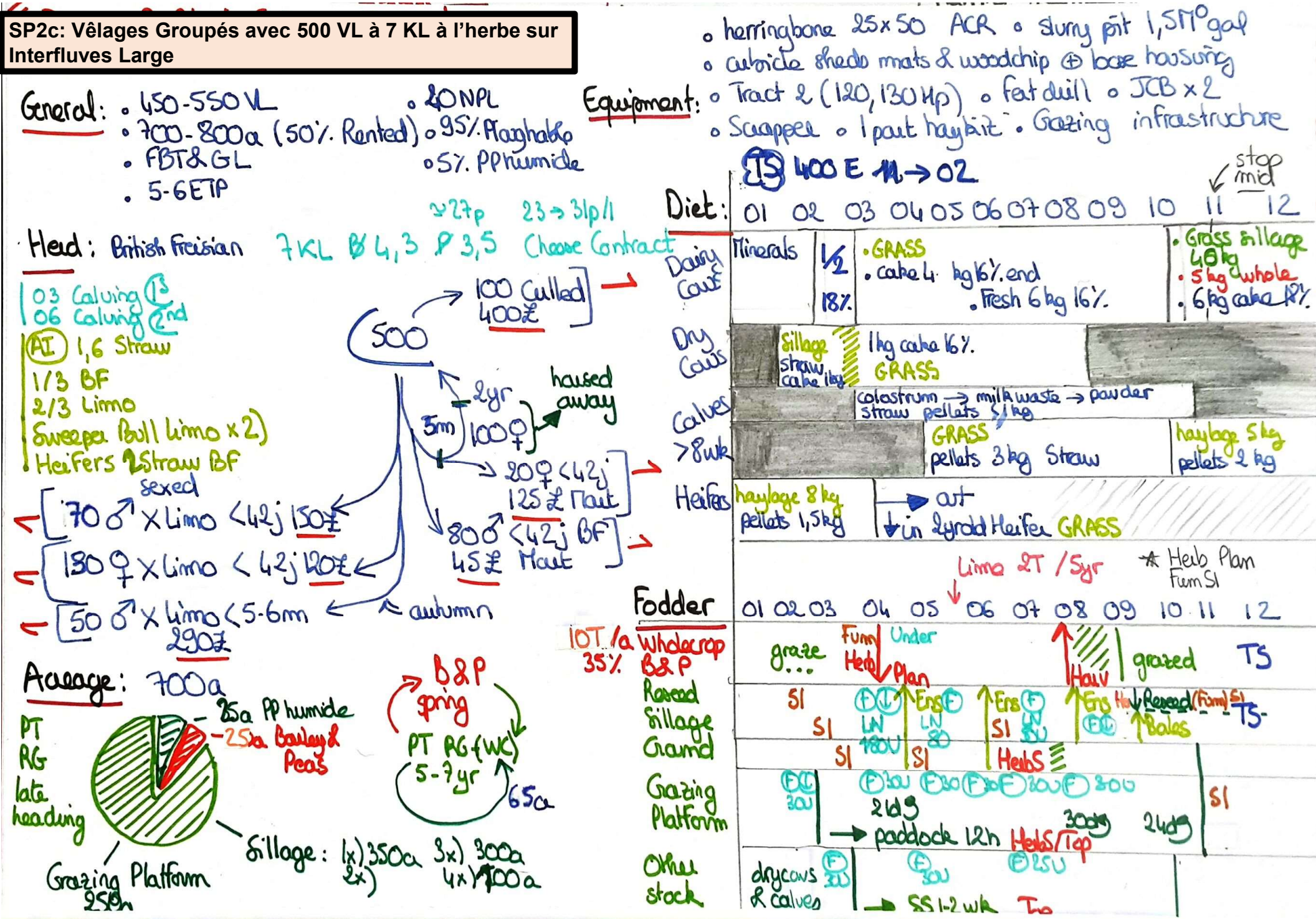
Diet:

	01 02 03 04 05 06 07 08 09 10 11 12
Dairy Cows	2kg silage grass, .25kg silage maize, Blend 20% pot 2kg; ½ .GRASS 6.5kg 16% P 8kg; ½ .15kg silage, cake 16% 1kg; •Molasses 1kg •straw 1kg
Dry Cows	dry pre calving; GRASS cake 2kg 18% P; silage grass 20kg straw 1,5kg Cake 2kg 18%
Calves	... colostrum → milk powder, calf pellets 1,5kg straw
>8 wk	haylage 5-8kg 2,5kg Blend 17% straw 1kg; GRASS 1,5kg nut; haylage 12kg 1,5kg nut
Heifers 2	... GRASS 1kg nut; haylage 20k 2kg nut

Fodder: Lime 2T/5yr

	01 02 03 04 05 06 07 08 09 10 11 12
	grazed; S1 Plant Funn Herb F1 +P-E; N-low Plan
	S1 F1 75U S1; Ens F 60U S1; Ens F 30U S1; Bales F; 30d; Bales; TS →
	F1 45U; 21d paddock 2x/d; F1 45U; F1 45U; F1 45U; Top/Herbs Dry Rotary; B40U S1; TS S1
	F 30U; F 30U; F 30U Top/Herbs Set stock 30d → 1wk Field; (S1)

SP2c: Vêlages Groupés avec 500 VL à 7 KL à l'herbe sur Interfluves Large



PS3a: Dairy Cows 9Kl for 120 DC on grass on big ridges

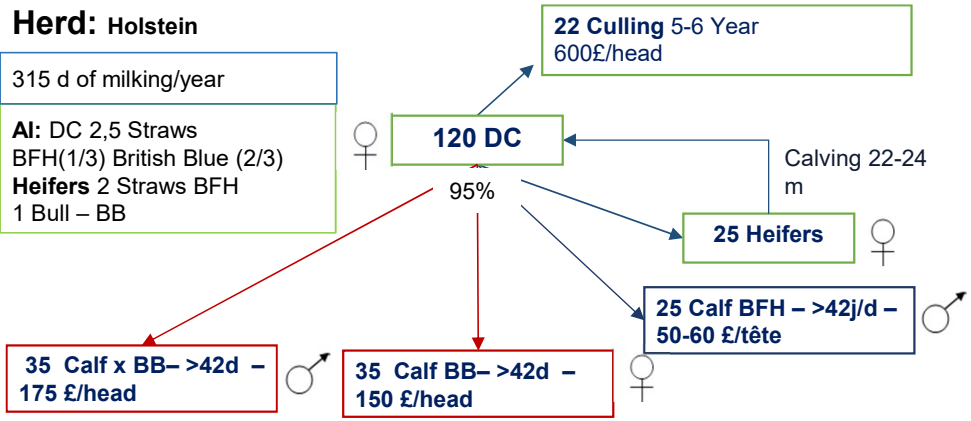
- 200-300a (40% rented FBT long term)
- 100 -150 DC – 80-120ha
- 1,5 Fam Wker

- 90% Ploughable
- 10% Humid
- 0% Sloppy

Herd: Holstein

315 d of milking/year

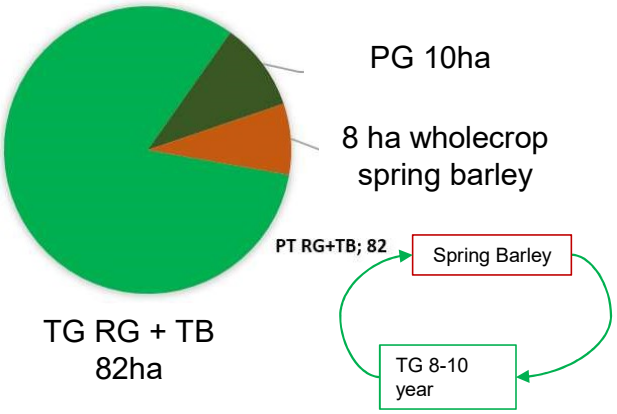
AI: DC 2,5 Straws
BFH(1/3) British Blue (2/3)
Heifers 2 Straws BFH
1 Bull – BB



Lime: 1/4ans

Liquid Milk Contract:
9 KL/DC
Fat: 40-42g/L Protein: 34 g/L – 28p/L

Fodder production: 100ha



4 LCU/ha

Equipment:

- Cubicle sheds (sand)+ loose housed area
- Slurry Pit 750Kgal
- Robot or Herringbone 10*10
- 2 tract + 1 Ration Mixer + Ice cooler
- 2 JCB 1 Skidsteer, various trailers
- 1 part of haykit and Fert speader, slurry tank
- Quad, Grazing infrastructure (tracks and paddocks)

Diet :

Month	01	02	03	04	05	06	07	08	09	10	11	12
Dairy Cows	40-45kg 25% Grass Silage 10 kg Cake 18%		Transition	Grazing 8 kg Cake 10kg ensilage						Transition	1kg Straw	
Dry Cows	20kg Grass Silage 2kg Straw			Grazing 2kg Cake 18% Prot							2kg Cake 18%	
Calfs	Colostrum **5j** Milk Powder 5-6L <**9sem**	**>6-7 sem** +1-2kg Cake + 0,5kg Straw		**4-5m** 3,5 kg Cake 1kg Straw 5kg Bales **4-5 m de 05 à mid 10** Grazing 2kg Cake 18%							12kg Bales 2kg Cake 18% 1 kg Straw	
Heifers 1	12kg Bales 2kg concentre 18% 1 kg Straw			Grazing 2kg Cake18%							15kg Bales 2kg Cake 18% 2 kg Straw	
Heifers 2			Grazing 1 kg Cake 18%								Silage 22kg 2kg Straw 1 kg Conc 18%	

Month	01	02	03	04	05	06	07	08	09	10	11	12
Wholecrop Spring Barley 8ha 15,5T DM/ha 35%			Plant Fym/têter	Fert 50 U	Fert 50U			Récolte	Plant Fert			
TG RG +WC 40ha 18T 15 T DM/Ha		Slu	Slu	90U	Sil 60U	Sil 50U	(HerbS)	Sil 30U	Bales	Slu		
TG RG+WC 20ha 15T T DM/ha		Slu	Slu	70U	Sil 50U	Sil 50U	(HerbS)	Sil 30U		Tran		
TG Grazing 28ha 2x/d Paddock/Strip	Slu		Tran Fert 50U	Fert 50U	Fert 50U	Fert 40U	Fert 40U (HerbS)	Fert 30U Top		Tran	Slu	
TG Grazing TG & PG Heifers 12ha/ Drycows 4ha	9 T DM/ha		Fert 50U	Grazed 1/Month 2-3j	Fert 40 U	Fert 40 U	Fert/Top 30U	Fert 30 U	Top?		(Slu)	

SP6.120DC.9kl.Grass	€ 2 018		€ 2 018
Raw Product/DC	3186	Added Value/Wker	44100
Intermediate consumption/DC	2635	Subsidies	23265
Added Value/DC	551	Agricultural Revenue/Family Wker	35641
		Subsidies - % AR	44%

PS3b: Dairy Cows 9,5Kl for 750 DC on grass on big ridges

- 800-1800a (50% rented) (GL & FBT short term)
- 500-1000 VL – 320-720ha
- 6 Wker+ 2 Family wker
- 85% Ploughable
- 10% Humid
- 5% Sloppy

Herd: BFH – Flying Herd

315 d of milking/year

IA: VL 2,5 Straws
British Blue (1/2) AA (1/3)
2 Taureau Hereford

750 DC

95%

180 Culling 4-5 year
400£/head30%

180 Heifers et 2nd Calvers
1400 -1500£/head

350 Calf x H/AA–
>42d – 180 £/head 365

375 Calf BB/AA –
>42d – 160 £/head 365

Liquid Milk Contract:
9,5 KL/DC Fat: 40-42g/L Protein: 34 g/L – 28p/L

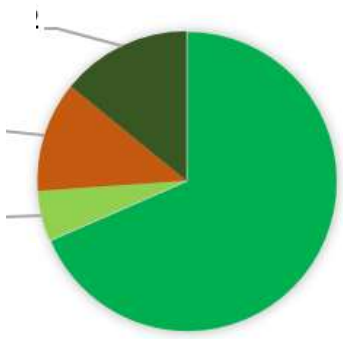
Fodder Production: 360ha

PG 52 ha

44 ha wholecrop spring barley

TG RGI 20 ha

TG RG + WC 252 ha



RG/ 5 year
RGI/ 3 year

Spring Barley

2,5 LCU/ha

Equipment:

- Cubicle sheds with ventilation (Sand)+ loose housed area
- Slurry pit 3-4m°gal 3m
- Rotolactor 50-60 pts + Milk tank 36 Kl and backup
- 3 tract + 2 ration mixer + Ice cooler
- 2 JCB 1 Skidsteer, trailers
- 1 part of the haykit, Fert, Slurry tank
- Quad, grazing infrastructure (Tracks and paddock)

Diet:

Month	01	02	03	04	05	06	07	08	09	10	11	12
Dairy Cows	35-40kg 25% Grass Silage		Transition	Grazing low and mid milker						Tra	2kg Straw 10kg 35% Who Barley	
Dairy Cows Groups	Low yielding <28L/d 18%-16% 7kg +hiver			Mid yielding: 28-35L/d 18% 8kg 30kg 25% Sillage + hiver				High yielding: >35L/d : 19% 9kg + hiver + hiver				
Drycows	20kg Grass Silage 2kg Straw			Grazing 2kg Cake 16% Prot						2kg Cake 18%		
Calf	Colostrum **5j** Milk Powder 5-6L <**9sem**						**>6-7 sem** +1-2kg Cakes veaux + 0,5kg Straw					

Tack sheep : 750 paid 65p/head/week from November to the end of February

Correction du pH des sols tous les 4 ans

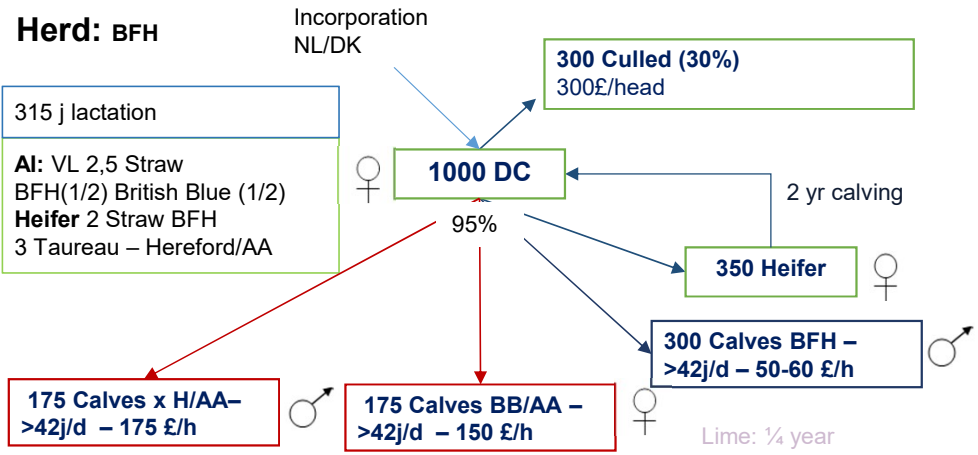
Month	01	02	03	04	05	06	07	08	09	10	11	12
Wholecrop Sring Barley 44ha	16T MS/ha 30% MS	→ Non semé M & B	Plant Fum/têter	Fert 50 U	Fert 50U			Récolte	Plant Fert			
TG IRG & RG +WC160ha 20T 17 T DM/ha		Slu	Slu	50U	Sil 50U	Sil 40U	(HerbS)	Sil	Bales	Slu		
TG RG+TB 20ha 16 T DM/ha		Slu	Slu	70U	Sil 50U	Sil 50U	(HerbS)	Sil 30U		Tran		
PT Pat 100ha Paddock 2x/j	Slu		Tran Fert 50U	Fert 50U	Fert 50U	Fert 40U	Fert 40U (HerbS)	Fert 30U Top		Tran	Slu	
PP Pât + PT Heifers 48ha/ Drycows 36ha	A 4T/MS/a		Fert 50U	Pâturé 1/Mois 2-3j	Fert 40 U	Fert 40 U	Fert/Top 30U	Fert 30 U	Top?		(Slu)	

SP7.750DC.9,5kl.Grass			
RP/DC	3275	AV/WKer	69900
IC/DC	2530	Subsidies	29601
AV/DC	746	AR/Fam Wker	66139
		Subsidies in % of AR	6%

PS3c: Dairy Cow 10,5KL 1000 DC BFH on Small Ridges with Maize

- 1300-2800ha (75% Rented)→500-1100Ha
- 1000-2200 DC520-1120ha
- 13 à 20 Wker + 2 Fam
- 90% Ploughable
- 5% PP Humid
- 5% PP Sloppy

Herd: BFH



Milk:
10 – 10,5 KL/DC
Fat: 40g/L Prot: 34 g/L – 28p/L

Tack Sheep: 750
Ewes 65p/head/week 11->02 3,5 Month

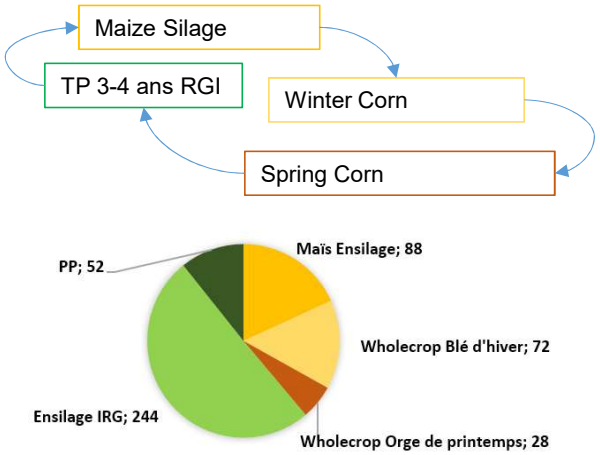
Equipment:

- Cubicles with ventilation (sand, sawdust)+ loose housed
- 2*Slurry Pits 3-4m°gal (distance)
- Rotolactor 50-60 pts + Bulk tanks 36 Kl and Backup
- 5 tract 2 JCB 1 Skidsteer, Trailers
- 1 part of haykit, Fert, Slurry tanker
- Quad, Mixer Wagon*2

Diet:

Month	01	02	03	04	05	06	07	08	09	10	11	12
Dairy Cows	10kg 29% Maize Silage 10kg 32% Wholecrop Winter Wheat					20kg 25% Grass silage 1kg Cake parlour 18% Prot						
Cake Distribution	<1m 18% 10kg			1m->3m 18% 13kg			3m->6m 19% 13kg			9m->end 19% 12kg		
Drycows	6 kg de Straw 12kg Silage Grass 5kg Wholecrop			Grazing 2kg Cake 16% Prot						2-3 kg Blend 18% Prot 0,300 kg Mx		
Calves	Colostrum **5j** Milk Powder 5-6L <**9sem**	**>6-7 sem** +1-2kg Calf pellets + 0,5kg Straw		**4-5m** 3,5 kg Cake 1kg Straw 5kg Bales **4-5 m de 05 à mid 10** Grazing 2kg Cake 18%						12kg Bales 2kg Cake18% 1 kg Straw		
Heifers	2kg Straw	Grazing 1 kg Cake 18%								Silage Grass 22kg 2kg cake 18%		

Fodder Production: 520ha



Mois	01	02	03	04	05	06	07	08	09	10	11	12
Maïze 28ha 17T MS/ha 30%MS	88ha	→ PT		Plant Fert Fum/têtee rb	Herb	Herb				Sillage Herb Plant	Herb Insect	
Wholecrop Blé d'hiver 17T MS/ha 35%	72ha 17T/a 30%MS		Fert 50U Herb	Fert 50U	Fert 50U Fong		Récolte	Plant Fert				
Wholecrop Orge de printemps 16T MS/ha 30%	28ha 16T/a 29%MS	→ Non semé M & B	Plant Fum/tête er	Fert 50 U	Fert 50U			Récolte	Plant Fert			
PT IRG 244ha 16T/MS 25% MS		Slu	Slu	80U	Sil 60U	Sil 50U	(HerbS)	Sil 30U	Bales	Slu		
PP Grazing + PT Heifers/Drystock	52ha 4T/MS/ a		Fert 50U	Pâturé 1/Mois 2-3j	Fert 50 U	Fert 50 U	Fert/Top 40U	Fert 30 U	Top?		(Slu)	

3 LCU/ha

PS3c.1000DC.10Kl.Maize			
RP/DC	3650	AV/Wker	58518
IC/DC	2597	Subsidies	32881
AV/DC	1053	AR/Fam Wker	45240
		Subsidies % AR	6%

PS4a: 90 Dairy Cows at 6Kl on Grass on Small Ridges

General: . 160a - 260a (25% Rented) . 70% PL . 20% PP hum . 10% PP pente
. GL
. 2-ETP

100 VL

Equipment: . abreast 6 . straw area . cubicle shed (sawdust) . slurry pit 250Kgal . slurry tanker . 2 tractor . 1 skidsteer . 1 pair of haykit . topper . fert drill . trailers

Herd: 310j⊕

All year round
2,5 Straws (AI)
1/3 BF
2/3 Limo

♂ 30 X Limo Mast 200£ <42d
♀ 30 X Limo Mast 150£

90 VL BF → 2,5yr 9-10♀ BF

9-10 Culled 350£ →

12♂ BF <42j 30-40£ Mast →

Milk 6KL B 4,0 P 3,2 B 4,4 P 3,3 FMilk 27p/P

Acreage: 200a

Sillage: 90a 1x) 2x) 50a 3x) (Balles)
Grazing Platform: 70a → 90a
Ygstock: 40a → ⊜
FF Strip Graz 2x/d → Free

Diet:

	01 02 03 04 05 06 07 08 09 10 11 12
Dairy Cows	• Sillage Ⓖ 30kg • Cake 20% 7kg • TRAN 1/2 • Grass 60kg • Cake 18% 6kg • 1/2
Drycows	• Sillage Ⓖ 20kg • Cake 18% 1,5kg • Grass 40kg
Calves >8 wk	• 5d Colostrum → • 5-6L Milk (mother) • calf pellet 2kg • haylage 5kg • pellet 2 | GRASS ⊕ 1kg pellet | • haylage 10kg
Heifers1	• haylage 12kg • nut 1kg | GRASS 20kg | • haylage 15kg • cake 1kg
Heifers2	• Sillage Ⓖ 18kg • cake 1kg | GRASS 30kg ⊕ | ...

Fodder

	01 02 03 04 05 06 07 08 09 10 11 12
Reseeded 15a	"GRASS" PL Fum (F)(↓) 40U → GRAZED S1
17T PT ensilage	S1 (F)(↓) 40U Ens (F)(↓) 30U Ens (F)(↓) 30U S1 Enr Hay
5 sillage	S1 Ens S1 (↓) Ens → (F)(↓)
PT grazed	(F) 25U (F) 20U (F) 30U (F) 30U (F) 30U → 21d Strip 2x/d (Herbs) S1 S1
43 PP & PT other	(F) 40U (F) 40U (F) 40U → SS return 1m 1-2 wk/field

PS4b: 200 Dairy Cows at 8,5Kl on Grass on Small Ridges

General:
- 250-350a (1/3 Rented)
- FBT
- 3 ETP (3,5)
- 80% PL
- 20% PP Humide
- 0% PP Rente

Equipment:
- herr 15x15 SIL +ions
- Cubicles shed (sawdust) + loose housed
- Slurry pit 1TP
- Feed mill
- trailers & cattlebox
- 2 tractor (150, 100)
- 1 pick hayhut
- JCB
- Scrapper

Herd: 330j 8,5Kl B 4,2 P 3,3 FTMilk Tesco

All year round

3 Straws (AI) sexed BFH
+ Hereford (2/3)
Sweaper Hereford

200 DC BFH
95%
40 450€
22-24mm
40 ♀
20 ♂ BFH <42j
Mast/Ab 45€

[Mast 170€ 75 ♂ x H <42j]
[Mast 140€ 75 ♀ x H <42j]

Acreage: 300a

TS: 400 E 80p/wk 11→02

230a PT RG+TB

40a PP humide
2,5-3 T MS/yr/ha
30a PT RG+TB reseeded

Less pressure summer Easier

PT RG TB 7-8 yr

Silage: 150a 1x) 2x) 100a 3x) Bales

Grazing Platform: 120a pad 2x/d

Other Stock: 30a → SS

Diet:

	01 02 03 04 05 06 07 08 09 10 11 12		
Dairy Cow	• Silage 40 kg • Straw 1kg	GRASS 75kg 6-7 kg cake 18% P	pasture cake 1,8 kg 20%
Dryow	• Silage 25 kg • straw 2kg • blend 1,5 kg 17%	GRASS 40 kg 1,5 kg cake 17% P	...
Calves >8 wk	• colostrum → • milk powder auto 6l/d • 2,5 kg pellets + haylage 5 kg		
>3m	haylage 5-8 kg 2kg pellet	GRASS 2kg pellet	haylage 10-12 kg 1,5 kg cake 17%
Heifer 1	haylage 15-18 kg	GRASS Ø	1,5-cake 18%
2	Silage 20kg	GRASS 1,5 kg cake	1,5-2 kg cake 18

Fodder:

Lime 1/4yr

	01 02 03 04 05 06 07 08 09 10 11 12
Reseeded	PT ens/grazed → Spr fum, Plant ... TS
PT Silage 18T/a	S1, S1, S1; F L 60U; Ens S1 F L 50U; Ens S1 40U F L; Bales (S1); X F
PT DC 16T platform	F 50U; F 50 F F E F 40U; Pad 24h 21d rct S Heib 30d S; S1
PP & PT 10T Other Stock	F 40U; F 40U; Top F 30U; F 30U; (S1); PP

PS5a: 200 Dairy Cows at 8 KI with Wholecrop on big ridges

General:
- 330-450a (50% Rented)
- GL & FBT
- 3,5-4 ETP (2,5 Farm)
- 70% Ploughable
- 20% PP humide
- 10% Pente PP

Equipment:
- Herr 16x32 . Cubicle shed Sawdust + Paille
- lisier/slurry pit 0,5 M° gal
- Slurry tanker . JCB . 3 Tract (120-130 Hp)
- Scapper . Haykit . Fert drill
- Muck spreader . Sprayer

Herd: 380d

All year Round / Toute l'année

2,5 Straw AI – BFH
Hereford Bull \ H
Heifers: Sync

200 DC/VL BFH
- 15% 500 £ 30
- 26m
- 40 ♀ BFH
- 40 BFH <42d ♂ Mart 30£
- 60 X Beef <42d ♂ Mart 200£
- 60 Stores 18m ♂♀ 400kg 650£ 04-05

Acreage:

PT Renewed Grassland 320a
- Pente/Sloppy 20a
- Humide 60a
- Barley & Peas Wholecrop 40a

Grazing Platform: 110a Strip grazing

1x) 150a
2x)
3x) 80a

TS 200 E 60p/wk 10-02 Silage

Diet

	01 02 03 04 05 06 07 08 09 10 11 12
Dairy Cows	Silage Clamp 40kg 25% DM . Who 5 kg (½) · Grass . Cake Boulou 16% P 3 kg/d (Buffer Silage 10 kg) (½) · Cake Paul 5-6 kg/d 18% P
Dry Cows	Silage 25 kg/d 30% DM . Straw 1 kg/d · GRASS · Nut 1kg . Minerals 100g
Calf >8wk	waste milk beef . powder milk dairy . pellets … · grass . rearing nut 1,5 kg . haylage 10 kg . rearing nuts 2 kg
Yearlings	Silage 15 kg 20% . licklocket ad . rearing cake 2 kg · grass → Drystock

Fodder

	01 02 03 04 05 06 07 08 09 10 11 12
GRASS → B&P 18T/a 30%	Spr Fum . PLI Fert Under 40U . Harv Fert . Grazing Silage
TP → Silage 18T 25-27%	TS . SI Fert 40U . SI Ens Fert 40U . Ens Fert 30U . Ens . SI . Ens SI . Ens . TS
Dairy Cow	25U → 21d rff 4lbloods 30d 20U 25d SI
Drycows Youngstock	50U . 2wk 2wk 50U . 50U

PS5b: 210 Dairy Cows at 8,5Kl with Maize on Big Ridges

General:
- 300-400a (25% Rented)
- GL 190 → 250 VL
- 3,5 ETP
- 85% Ploughable
- 10% PP humide
- 05% PP penta

Equipment:
- Her 16x16 Fast ACR
- Slurry Pit 0,5 mgal
- Slurry tanker
- JCB
- Wagon Mixer
- Skidsteer
- Scoop
- Hayhit 1 pair
- Fert drill
- Mack Sprayer
- Tractor 3 (120-130 Hp)

Herd: BFH 385d Milk 8,5KL Ø4 P3,4

All year round

Dairy C 1x2x) BFH → AA
Heifers 1x2x) Sexed BFH
Sweeper Bull Hereford

- 27 ← ♂ X AA/HK 42j Mast 170£/h
- 56 ← ♀ X AA/HK 42j Mast 150£/h
- 210♀ DC 96% ↑ 2,5yr 63♀
- 63♀ Culled 700£
- 250♂ BFH 40£ <42j Mast
- 20-30♂ 24mm Straw XAA/H → 750£

Diet: (Megalac) (TMR)

	01 02 03 04 05 06 07 08 09 10 11 12			
Dairy Cows	10kg Silage Mai 35kg Silage Grass 0,5kg straw	1/2	• GRASS 60-70kg • Cake 6→7kg 18% Prot (Buffer)	1/2 Cake 18% 8kg
Dry Cows	25kg silage (F) 1,5kg Straw		• GRASS 1kg cake 18% Prot	cake 18% 1kg
Calf	• milk powder (auto) • pellet 1→1,5kg			
>8wk	haylage 5kg pellet 2kg		• GRASS • rearing nut 1,5kg	• haylage 10kg • rearing nut 1kg
Yearling	haylage 15kg cake rearing 1kg		• GRASS	Silage 20k (
Heifers	haylage 15kg cake 2kg		• GRASS	Silage 20kg cake 1kg

Acreage: 380a + 40a PPhumide

- RG + WC 280a
- 30a Maize → Pot 30a → Grass RGA+WC
- 140a Silage 1x2x) 3x) Bales
- 120a Grazing Platform ⊕ 20a Other Stock

T5 300 E 65p/wk 10-02end

Fodder

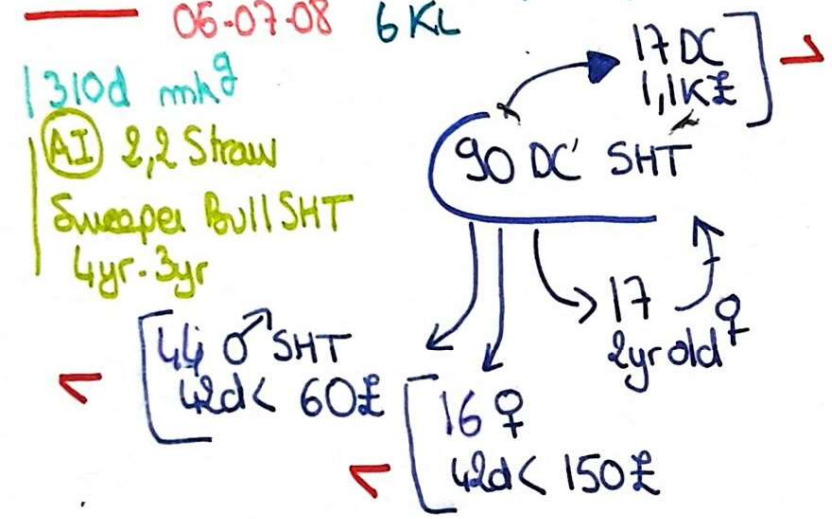
acre	01 02 03 04 05 06 07 08 09 10 11 12
18-19T 29% DM Maize	GRASS → Herb Plant(c) Herb Fung POT H (cover)
Reseeded 30a	S1 S1 (F) LN 180U Ens Ens Ens S1 S1 Plant(c) TS
18T 27% DM Silage	TS S1
Grazing Plat	(F) 35U paddock → (F) LN 100U 21d 2x1d Strip FF Top/Mobs (F) 30U 30d ⊕ S1 TS S1
Other Past	(F) 40U Set stock 1wk/Field 30d (F) 30U (F) 30U Top/Mobs IS

PS6a: Dairy Cows Organic 90 DC for 6 Kl et 90VL on big ridges

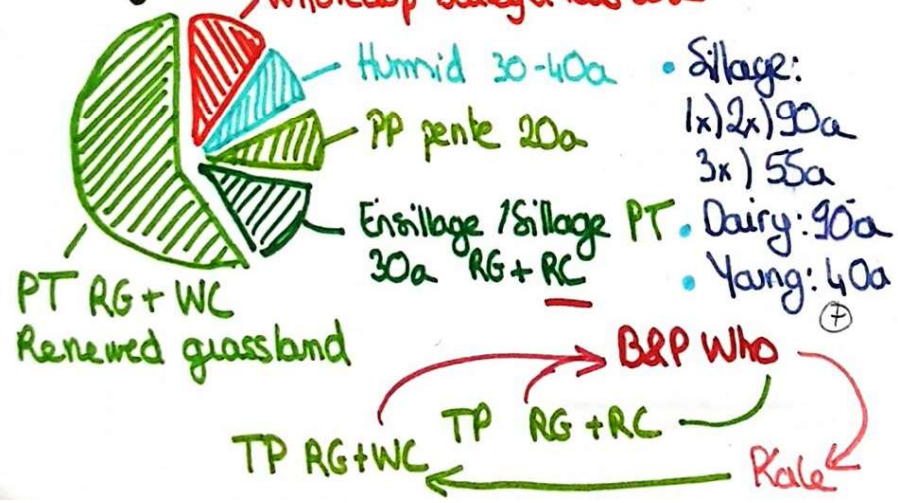
General:
- 300a-350a (50% Rented)
- FBT
- 2-2,5 ETP (Farm)
- 80% PL
- 20% PP H
- 10% Pente

Equipment: as-tir
- abreast 6 (refurb) cake kerbs
- slurry 250 Kgal
- hayshed → cubicle ⊕ sand
- muck spreader side
- PL ⊕ PH
- 2 tract (160, 100) FL
- maurer haybit
- JCB
- sand disp
- Feat duill
- loose haused
- Slurry tanker
- sillage pits

Herd: Summer 05-07-08 Milk B 4,2 P 3,5 30 → 40p/l 6 KL



Acreage: 320a



Diet:

	01	02	03	04	05	06	07	08	09	10	11	12
Dairy Cows	Silage Clamp 34 kg 28% Who 5kg; Cake parlour 18% 4			Silage 20 kg Kale Strip 3		Grazing 55 kg					½ Silage 35kg Who 5kg; 5kg 18% P cake	
Dry Cows	Silage Clamp 15 Bales 5-10 Cake 2					GRASS Cake 2kg 16%						
Calf >8wk	milk 2→6 l/d			pellets 0,5kg		(Colostrum)						
							18% P cake 2kg Straw				Bales 8kg	
1year	1kg cake 18%			1kg cake 16% GRASS							Bales 18kg	
2year	Silage 20:25 2kg Cake 18%			GRASS Cake 16% 1kg			→ Dry cow					

Fodder:

	01	02	03	04	05	06	07	08	09	10	11	12
B & P				Prepa PL Furm/Ch (Under)			Who	Past Sw Kale				
Sillage	S1			S1			(S1)		Bales			
	S1			S1			S2					
Dairy Cow				24h paddock 1-2j		paddock 24h			Furm (S1)			
Kale	STRIP			Raserm		TOP		TOP				
Young												

PS6b: Dairy Cows Organic 7 Kl 200 DC on big ridges

General:
- 420-480a (50% Rented)
- FBT
- 2 ETP Farm + 2 FT
- 90% PL
- 10% PH
- (10% Penta)

Equipment:
- herring 16x32 (refurb) . slurry 500 KL
- cubicle sheds mats & sawdust ⊕ loose housing
- Tract x 3 (150, 130, 110 Hp 4WD) . JCB . Skid
- Slurry Tank & Muck spreader . Soil tool . hayfait (F)
- topper

Herd: 310d 7KL

spring: 04-05
summer: 08-11
or 4yr

AI 2 → 0,9 BF
0,1 Beef

Sweeper Bull BF 2yr

BF 4,1-4,2 P 3,3-3,6
36 p/l
42 p/l

200 DC BFH x J

→ 40 DC 700 kg/h 600 kg lw

2,5yr
40 ♀

♀ 20 Beef <3wk 150-200 kg

♂ BF 80 50 kg <3wk

40 ♀ BF 150 kg

Acreage: 450a

PT
WC + RG
280a

- Wholecrop Barley 60a & Peas (Under) — 9-10 T/a 35% DM
- Stuble turnips 15a
- PP humicle 45a
- PT Silage 1/5yr AC + RG 150a

Cow Cow grazing: 2000a pad/d 12h

Silage: 1x) 5T/a 150a; 2x) 4T/a 150a; 3x) 3T/a 50a bales

Young stock 60a; Young 60a

chicken muck 100T 14 kg/T

SS SS/2x/wk

Diet:

	01 02 03 04 05 06 07 08 09 10 11 12
Dairy Cows	Silage 30 kg bales who 12kg · GRASS 60kg (TURNIPS) · Cake 2,7 kg 18% P · bales · lau: Cake 2kg/18% P high: Cake 7kg-18% P
Dry Cows	Cake 2kg 18% P · Straw 1 · bales 5 Silage 15 · GRASS 40kg · X
Calves 12wk	Colostrum → milk 2x 3 → 5L · calf pellets 0,5 → 1kg · Straw 0,5-1kg · haylage dry / hay 0,5 → 2kg ⊕ · X · GRASS 30kg · haylage 8 → 12 · Straw 1-2
Heifers	Cake 2kg/d 16% P · GRASS 25kg - 30kg · Silage 15-18 · cake 2kg
...	TRAINING 2wk GRASS 30-40kg TRAINING 2wk

Fodder:

	01 02 03 04 05 06 07 08 09 10 11 12
B&P	Graze · Mulch + Chi · Cull · Under · who ... · Grazing
Turnips	Graze · Lime · Cull · <STRIP> · Reseed (S1) Cull ...
Silage RC	S1 · Reseed · Cut/Muck
Silage WC	S1 S1 · Ens · Ens · Ens · Ens · Ens/Bales S1 · Grazing
Graz ground DC	→ Paddock 30d · 30d · X · S1
Young	30d ⊕ SS (TOP) · (TOP) · (TOP) · S1

SP7a,b,c: Loueur de terres – Rent Out – Pré-Retraite

- 60-120a (0% Loué)
- 25 à 50ha enregistré par la PAC
- 1 ETP (Touchant une pension/ou autre source de revenu)

- 70% Terres Labourables
- 15% PP Humides
- 15% PP Pentue

Equipement:

- 1 épareuse
- 1 tracteur avec fourche (90-100cv)
- 1 topper
- Kit d'entretien des barrière
- Semoir à engrais

Sources de revenus:

L'agriculteur touche les Subsidiess de la PAC

Pension ou activité complémentaire: Paysagiste, Clotures, Epareur…

SP7a: Controle de la terre

Mouton à l'attache- Brebis : 200 pour 70p/tête/semaine de octobre à mi-mars sur les terres ensilées.

Grazing License/Handshake : Location de la terre pour la récolte de l'herbe ou pâturage sur la saison pleine de la pousse de l'herbe 03-04 → 10.
Prix variant de 80£ à 130£ par acre (exploitation viande – exploitation laitière)
Le loueur paye le renouvellement des pâtures.

SP7b: Controle de la terre donné au locataire

Grazing License/ Handshake/FBT: Location de la terre sur l'année calendaire. Prix variant de 90£ à 150£ (exploitation viande – exploitation laitière)
Le locataire paye le renvouvellement des pâtures et gère l'assolement. En accord préalable avec le loueur.

SP7c: Production de fourrages

Mouton à l'attache- Brebis : 200 pour 70p/tête/semaine de octobre à mi-mars sur les terres ensilées.

L'agriculteur produit des balles d'ensilages et de foins pour les vendres aux exploitants locaux (loisirs ou actuels).
Les Balles d'ensilages sont vendues entre 15 et 20£/Balle et les bales de foin à 3,5£/Bale de 20-25kg (destine aux chevaux)

Affouragement & ITK:

PT RG 7-10ans

Comme sur l'exploitation prenant les terres en location

Mois	01	02	03	04	05	06	07	08	09	10	11	12
PT resemée – 4ha RG et TB								Herb Fert	Slu Prep + Sem			TSs
PT– Sillage PP- Foin 28ha Bales 17,5 Balles/ha 8ha Foin 260 Petites Bales/ha 36ha Bales 10 Balles/ha			Fert 50U Fert 40U		Bales Fert 30U	5 Foin	Bales HerbS	Bales	Bales			TS

SP15.LoueurControle	€ 2 018		€ 2 018	SP16.Producteur de fourrages				SP17.Loueur			
Raw Product/Ha	64	Added Value/Actif	7241	PB/Ha	172	VA/Actif	4826	PB/Ha	46	VA/Actif	6634
Intermediary Consumption/Ha	20	Subsidies	11155	CI/Ha	134	Subsidies	9660	CI/Ha	14	Subsidies	8280
Added Value/Ha	32	Agricultural Revenue per family worker	16671	VA/Ha	21	RAI/Actif Fam	12761	VA/Ha	29	RAI/Actif Fam	13189
		Subsidies % RAIC	67%			Subsidies % RAIC	76%			Subsidies % RAIC	63%

PS8: Supports Farmer- Heifers rearing and Crops production

General:
- 250-350a
- 200→500heads
- owned or AHA/FBT lg term
- 10% PP humide
- 90% Ploughable

Equipment:
- 2 tractor (110Hp, 130 Hp)
- Fert Drill
- trailers
- 1 post haybit
- Mower
- soil work tool
- Sprayer
- cubicle shed 100-150 DC mat & woodchip
- conversion ⇒ loose housed sheds / separation

Herd: TB linked with other farms 17-18m

→ 5-6m old (60p/d, 1£/d) → 23m old before calving

Summer 550tot
Winter 300tot

- Health/Food Bought in } → covered by home farm

Diet:

	01 02 03 04 05 06 07 08 09 10 11 12		
Weaned	• 3-4 kg cake • straw • 8 kg haylage	GRASS • 2kg cake	• 12kg hay- • 2kg cake
Yearlings	lage straw	GRASS 1kg cake	• 20 kg • 1,5kg
Heifers	Haylage cake	GRASS 1kg cake	20kg haylag 1kg cake

↑ not further

Acreage: 330a

- Grazing Platform Youngstock: 50a - 60a
- Silage Gand 50a 1x) 2x) 3x) Bales

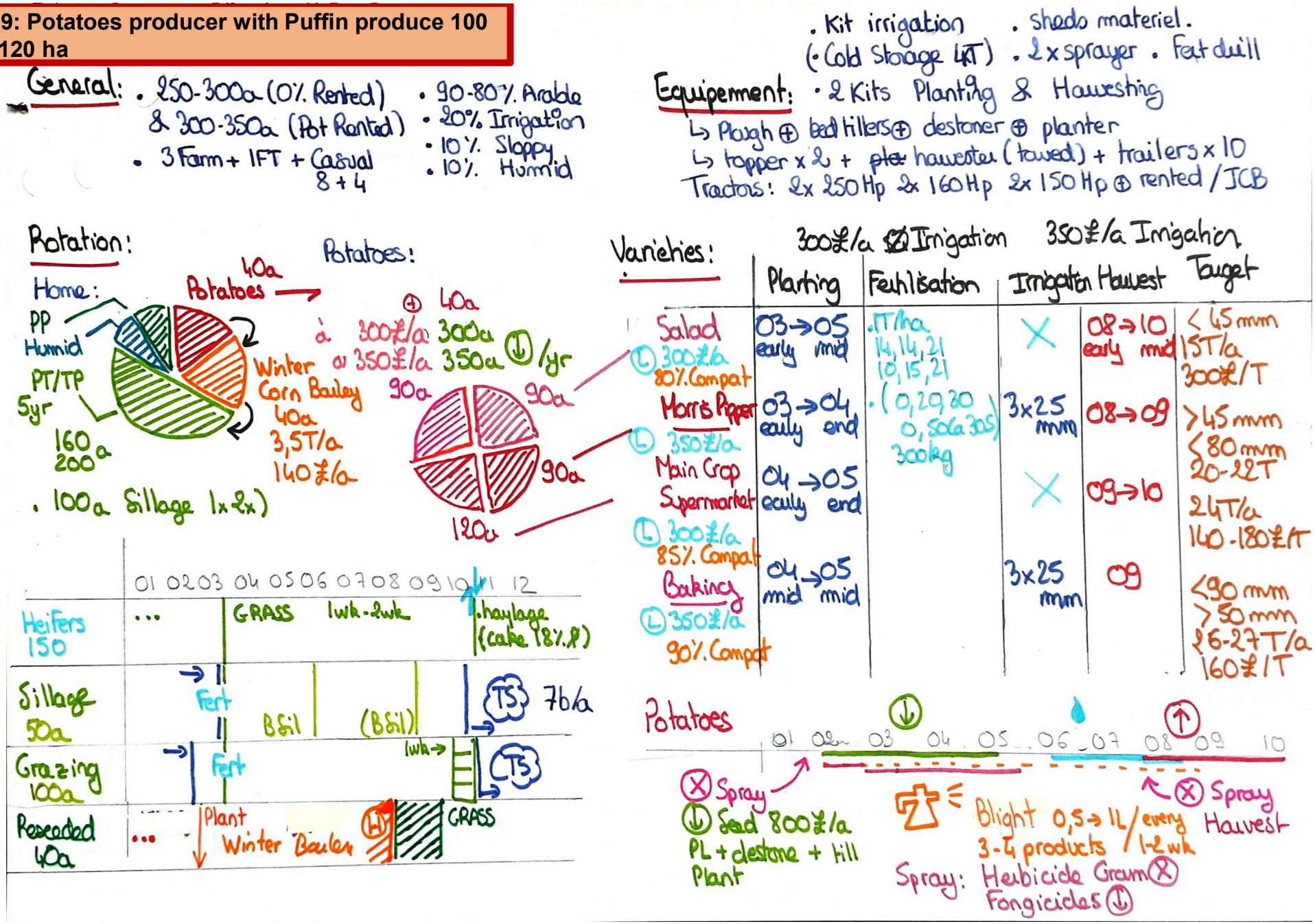
sold 1/2 bales 15-20£/b 12b/a

TS 200 E 10→03 mid. 70p/wk

Crops

	01 02 03 04 05 06 07 08 09 10 11 12
Maize 18T/a 30% DM	grass → TS; SI Farm; Fert Herb Plan Herb; ...PdT Harv
(PdT)	PdT ...; Herb Plant
Winter Wheat	... F 30U Herb; F 30U Short; F 40U Fungi (Fungi) ...; Plant Harv; TS
Silage Grand	TS; F L 30U; F L 35U Bales; F L 20U Bales; SI TS Bales
Pasture Grazing	

PS9: Potatoes producer with Puffin produce 100 to 120 ha



PS9.Pommesdeterre			
RP/Ha	858	AV/Wker	103445
IC/Ha	481	Subsidies	22414
AV/Ha	318	AR/Fam Wker	94480
		Subsidies % AR	5%

PS10a: Storecattle rearing from 3weeks à 24month old on small ridges

General:

- 170-200a (30% Rented)
- 150 heads
- 1 farm + 1 ETP
- 50% arable
- 70% Ploughable
- 15% Sloppy
- 15% Meadow Humid

Equipement:

- Loose housed sheds
- Cowshed for calves
- quadbike • UTV
- 1 JCB / Skidsteer • Fertilizer
- 2 Tractor (1 with Front Loader) 100 Hp ⊕ Trailers
- Mower • Muck spreader

Herd:

19-23 month

→ 03 04 05 08 09 10 | Dairy X Beef 3wk 140 ♀ 200 ♂ → 90/year Batch 30 → 4m Weaned

été 20m printemps 24m

← | 45 ♂ Steer 800 £ 400-500kg 900

← | 45 ♀ Steer 750 £ 400-450 kg 850

Tack Sheep: 11 → 01st/03 180 E 70p/wk

Diet:

01 02 03 04 05 06 07 08 09 10 11 12

Calves	→	• Straw • 4→6L/milk powder • 1kg pellet	GRASS • 1,5 kg/d calf rearer	• haylage 12-14kg 40% • 2kg/d calf rearer
		GRASS ... →	milk ...	haylage ...
Yearlings		GRASS		• haylage 20kg 40% • blend 2,5kg 12% • minerals
Stores	→			
	GRASS →			

Acreage:

Temporary Pasture

Grouped →

PP sloppy
PP humid

RG + WC long term → Reseeded 10a

8b/a 2x) 6b/a 1x) → Silage 45a 20a

PB/h
CI/h
VA/h

VA/actif
Subs°/achf
Revenu/Achf

Fodder Production:

Lime 2T/a /5yr

01 02 03 04 05 06 07 08 09 10 11 12

Reseeded 10a	GRASS PT →		20T/a Lime F.Y.M		PL				Light Grazing Calves			T3
Silage 45a		→ Fert		BSil	Fert		BSil →		F.Y.M			T3 →
20a		→		BSil								
Grazing ground 75a PT/TP	→ Fert		→ Yearlings Store			Top Fert				1wk	1wk	1wk 1wk →
PP 30a	→	Fert	Calves Young →			Top		1mn	1mn			→

PS10b: Suckler Cow farmer producing 24 month old storecattle on small ridges

General:
- 100-180a (Rent 30%)
- 40 → 50 Suckler Cow
- 1,5 Family
- 75% Paghalda
- 25% PP humida
- additional activity

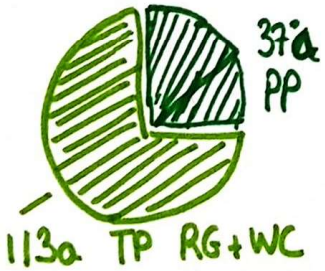
Equipment:
- converted dairy cubicles on straw or sawdust
- slurry pit
- loose housed shed
- straw shredder
- Fert Drill
- tractor x2 FL (100 Hp, 95 Hp)
- Scrapper
- Quadbike
- 1 pair hoykit
- trailer / cattlebox
- topper

Head:
- 1-2 ♂ 150€ <3wk
- 5 Cows 850€ 750kg
- 45 Suckler Cows Welsh Black / Hereford
- 1 Bull Limousin changed every 2 year
- Calving 1/3 08-09, 2/3 04-05
- 5♀ 2 year old
- 22-24m Steers 230 600kg 900€
- 17♀ 24m Steers 550kg 850€-800€
- Storecattle 6m old Weaned 200kg X Dairy breed
- Autumn
- Steers 24m old 600kg 750-800€ X Dairy Breed
- Tack Sheep 150 Ewes 11→02 65p/wk

Diet:

	01	02	03	04	05	06	07	08	09	10	11	12
										Bull		
Suckler Cows	haylage 20kg, bolus, 1kg cake 15%					GRASS						
Calves	MILK			GRASS						Weaned, silage/haylage 8kg		
Weaners												
Yearlings	silage grass 18kg, 1kg cake 15%					GRASS						
Strong Steers	silage grass 15-20kg, 1kg cake 15%					GRASS 75%					25%	
Heifers												

Acreage: 150a



GRASS TP 10 year 7

Fodder:

	01	02	03	04	05	06	07	08	09	10	11	12
						Lime 1/3 year, 2T/a						
15a Reseeded						Herb Fym, 50U Plant, Grazed						
13½a Silage	Sheep					30U Bales			20U Bales		Fym	Tack
Grazing TP										Top, return 1 month, Set stock 1-2 wk/field		Fym
PP										Top Herbs, Set stock 2wk	Top	

Silage Grand: 1x) 80a 2x) 50a Bales

Grazing:

PS10c: Fattener with low LWG on small ridges

General:
- 80a - 160a (50% Rented)
- 80 - 180 cattle
- 1,5 Family
- 20% PP
- 80% Ploughable

Equipment:
- cubicles converted to base housing on straw
- straw shredder · JCB · 1 Tract (100 Hp) Front Loader
- Fert drill · 1 part haylait · topper
- (Muck spreader) · Trailers · Cattlebox

Herd:

X Dairy Weaned Calves 250kg 68cm 300£
- ① Spring 03/04 — 2/3
- ② Autumn 07/09

X Dairy Steers 12-18mo 800£ old 400kg
- ① Spring 03/04 — 1/3
- ② Autumn 07/09

100 Winter → 140 Summer

♂ 50 390kg Bw Fat 30m ofd 340p/kg

♀ 50 Fat 375kg Bw 30m ofd 335p/kg

Sold 02/04/07/09

Tack Sheep: 180 store lambs 09-10 → 01-02-03 70£/h → 90£/h

Acreage: 130a

Wholecrop → Grass 7 [illegible]/year

↳ Silage ground: 1x) 55a Clamp 2x) 40a Bales

↳ Grazing: 35a + 25a

Diet:

	01	02	03	04	05	06	07	08	09	10	11	12
Weaned Calves	GRASS											
	cake 15% 0,5kg											
Yearling	haylage 10-12kg wholecrop 1,5kg cake 15% 1kg	GRASS (PP)									silage	
2year old	silage grass 20kg wholecrop 7kg cake 15% 1,5kg	GRASS										
	Finishing											
store lambs	GRASS cub cake 10%										GRASS 0,5kg/d	

Fodder:

	01	02	03	04	05	06	07	08	09	10	11	12
10T/a 35% Wholecrop Barley & Peas			Fum Herb	Plant	Undersown			Harvest	Lamb Grazing			
7T/a 3T/a Silage grand	Lambs		FYM 40U 200 SI			FYM 30U			Bales	Grazing	lamb	
			Fum		Sil				Grazing	Fum	Lamb	
Grazing PT/TP			FYM 30U		FYM 30U Return 3week → 1month Rotation 1wk					Fum SI		
PP			(FYM 30U) Return 1month Rotation 2wk									

SP11a: Fattener from 3 weeks to 30 months with corn on big ridges

General:
- 300 - 400a (25% Rented) or 100% AHA
- 300 - 400 Cattle
- 95% Ploughable
- 2.5 Family
- 5% PP

Equipment:
- Loose housed shed for every cattle
- Slurry pit
- Straw
- JCB
- 2 Tract (150Hp, 100Hp) with a FrontLoader
- Feedwill
- Plough
- Power harrow & soilhoof
- Sprayer
- Drybut complete

(Ewes Possible)

Herd:

♂ Calves 75kg All year round Batches of 30
2-3wk old
150 £ 200
Dairy Breed X Beef Continental

350 Summer 300 Winter

♂ 28-30m Bw 400 - 420kg
360 365 p/kg Beef

TS 400 Ewes 11→02 end 70p/wk

Diet:

	01	02	03	04	05	06	07	08	09	10	11	12
Calves	• Milk Powder 6L/d • Straw • Calf Pellets											
>12wk	haylage 2→5kg rolled cereal 2kg cake 15% 1kg				GRASS PP cake 15% 1kg				haylage 8kg rolled corn cake 15% 1			
Yearlings	haylage 12kg corn 2kg cake 15% 1kg			GRASS								Silage
2yr old	Silage 22-24kg corn 3kg cake 10% 1kg			GRASS cake 10% 1kg								Silage corn 4kg
	25kg cake 1kg 10%			GRASS								

Acreage: 350a

↳ Silage Ground: 60a 1x) 2x) Cut → haylage
↳ Clamp

↳ Grazing: 195a + 20 PP

Fodder:

Lime 2T/a /4yr

	01	02	03	04	05	06	07	08	09	10	11	12
PdT			PdT						Fymn Herb Plant			
Winter wheat 3T/a Straw 1T/a	Herb	F 40U	Short Fungi	F 40U Short Fungi					Harv	Plant F 40U	Grazing	
Silage ground 15T/a 35%		SI	F(L) 40U			F(L) 200 Sil			Bales		Grazing	
Grazing ground PP			F(L) 60U		Top / Herbs							
				Set Stock 2wk rotation								
					Top/Herbs "Top"							

PS11b: Suckler Cows producing 28month old beef on big ridges

General:
- 300-400a (25% Rented) FBT
- 90-120 SC
- & Family members
- 95% ploughable
- 5% PP

Equipment:
- cubicles sheds mat & sawdust
- loose housed straw
- straw shredder
- tractor 3 (110 Hp - 120 Hp)
- JCB
- Scapper
- 1 post hayliftt
- trailers & cattleboxes
- topper
- quadbike
- Fert drill

Head:

Bull 5 Hereford/Belgian Blue 1,5 K£ → 5yr → 1 K£

100 SC (X Dairy Cows)

04-05 calving 95% 22-24m Calving 15♀

♀ 24-28m 33 370-380kg DW 345p/kg

♂ 24-28m 47 380-400kg DW 350p/kg → 2year old

15 750-800 kg LWW 0,9-1 K£

400 Tack sheep 70p/wk 11→02end

Diet:

Suckler Cows

Calves

Yearlings

Bulls

	01	02	03	04	05	06	07	08	09	10	11	12
Grass silage 25-30kg → haylage bolus (mineral/salt)	GRASS											...
Grass silage 15kg	GRASS (Heifers: 1,5kg cake 18%.)											...
Grass silage 20kg 2kg cake 12%	GRASS						SC					

Acreage: 300a

- 15a PP
- 25a Reseeded
- 10yr GRASS
- PT RG+WC 250a
- Silage ground: 130a 1x) 2x)

vente 20£/t 50t 9-10T/a Silage ground 35% → 40%

Fodder

Reseeded

Lime 20a/yr 2T/a

	01	02	03	04	05	06	07	08	09	10	11	12
grazed ...								Herb Plant	Fum	...		TS
TS	S1	40U			Silage		30U		Bales			TS
		20U			20U		20U					S1
					10 batches Set Stock 1 week/field 3wk							S1
			30U									

Grazing PT

- Grazing Platform: 90a Suckler Cows
  70a Yearling
  2nd year old

PP

PS12a: Suckler Cows, 28month beef production on Old Red Sandstone – Big Ridges

Graaal:
- 400 to 500a (50% Rented)
- 160-180 SC continental breed
- 2-2,5 Family • 80% PL
- 10% PP humid • 20% PP pente

Equipment:
- loose housed sheds for everyanimal • straw shredder
- tractor 3 (100Hp, 120Hp, 150Hp) • Soiltool • JCB
- Scapper FL • 1 part hayrkt • Fert drill • Muck spreader
- Baler • Plough •

T5 300 Ewes 11→03 65p/wk

Herd:

Bull / AI / Straw
Limousin / Chau
05 → 06

180 Hereford / BB

16 Dw 350 kg 375 1,1-1,2K£

03-04 calving inside CCTV

80 ♀ Fat 380kg 27-28 mm Dw 335p/kg

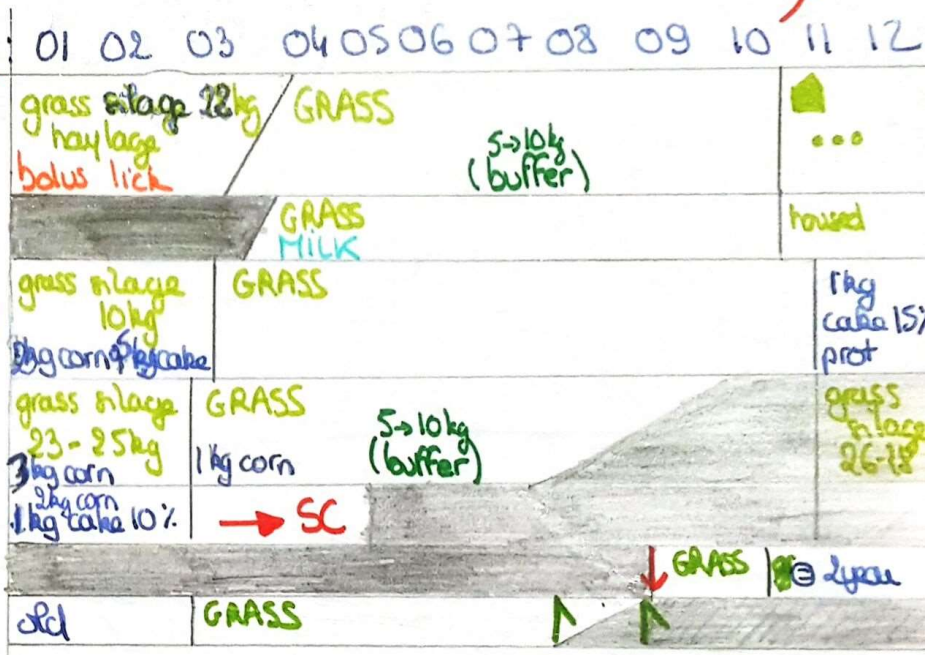
2yr 16

80 ♂ 26-27mm 410kg Dw 350p/kg

15
35 Steers 18m 700£-800£

35 Fat 315p/kg 350kg Dw 27mm

Diet: 01 02 03 04 05 06 07 08 09 10 11 12 — Culled



Acreage: 450a

7 5yr GRASS PT PG+WC → PdT 3Rent out → Winter Wheat

- Silage ground: 150a 1x) 2x) Cuts 100a 3x)
- Grazing ground: 130a + 80a PP

Fodder 01 02 03 04 05 06 07 08 09 10 11 12

PdT	PdT — Farm / Plant Herb
3T/a Winter Wheat	SOU Short Herb, SOU Short Fongi, Plant Harv SOU, T3
Silage Ground	T3, Sil 45U, Sil 30U, Sil 20U, Bales Graze, T3, Farm
Close Far away Grazing ground PP	SC Calves 4g stock, 5pU, Set stock, 1wk / field return within 2m→3wk, Farm, SOU

2,5 LCU/ha

PS12b: 750 beef fast fattener/finisher on Old Red Sandstone – Big Ridges

S/LiM

General:
- ~~200~~ 1000-1200a (75% Rented)
- 500-1000 Stores
- 2-3 Worker
- FBT
- 100% Ploughable
- 2 sites or ⊕

Equipment:
- loose housed sheds for 500 Animals - straw
- silage pits
- wagon mixer
- JCB
- Tract 3-4 ↳ 150 160 120 x 2
- Truck or big cattle box
- muck spreader
- straw shredder
- mower
- Plough + work soil
- Fert drill
- Sprayer

Herd:

Bovine:
- Strong stores 24m⊕ old → LWW 600 - 550kg → 750 £
- 2m-4m 450 in → 300 out >4m
- 1,7kg/d Stay 1,2kg/d
- → Fat Slaughter Contract O 3-4 L → Dw 350 - 375 kg → 360p/kg → 1,26 K£

Ovine:
- Store lambs → 1200 → 10-11-12 → 60 - 65 £/h → 1100a
- 1200 tot → Fat lambs 02-03-04 → 85-90 £/h

Acreage:

RG+ WC 530a
- 200a PdT Rent-Out
- 330a Winter Wheat / Spring Barley
- 50a Fodder beat

Grazing platform 300a (including winter mat)

Silage ground cuts: 1x) 230a 2x) 230a 3x) 230a ⊕ 50a

Fodder beat → Spring Barley → PdT → Winter Wheat → PT Grass → Fodder beat

Sacrifice → Grazing ground

PdT 20-30 £/T Straw: 2,5T/ha

Diet:

	01 02 03 04 05 06 07 08 09 10 11 12
short stay	• Grass silage 15kg • Fodder beet 9kg • Rolled wheat 5kg • waste potatoes 16kg • Straw 1kg
Long stay	out • Grass silage 15kg • Fodder beat 7kg / GRASS • Fodder beat 4kg • Rolled Corn 3kg • waste potatoes 14 kg / out • pot 14 kg • Rolled corn 4 kg • Straw 1 kg
Lambs	GRASS 2 kg lambcake / GRASS ⊖ "adlib"

Fodder:

	01 02 03 04 05 06 07 08 09 10 11 12
	Lime, Herb
GRASS	Farm Ens, Herb Plant, Herb, Hay
Herb (Farm)	Herb Plant, 30U 30U, Harv
PdT	Pasture/GRASS, Winter Wheat Herb
	90U Herb short, 20U Fongi, 30U, Harv, GRASS
Lambs	50U, Ens 30U, Ens, Bales, Lambs
Wintering	Till/Renew, Top/Herbs (Top), Lambs
	40U, 30U, 20U, W ...

1,9 LCU/ha

PS10d: 400 ewes with suckler cows on grass on small ridges

General:
- 150-250a (75% Owned) . 80% Ploughable
- 20 → 45SC 300 → 500 Ewes . 20% PP
- 2 Family ⊕ casual

Equipment:
- Loose housed shed for all animals kept - straw
- straw shredder . tractor 2x (100Hp, 120Hp) frontloader
- mower . JCB . Quadbike . 1 post hoylift
- trailers. Cattlebox

Herd:
- Bull Simmental Charolais
- 2-4 Calf 50£ → 3 700kg 900£
- 30 Suckler Cows calving 03-04 inside
  - 2yr 3♀
  - 15♂ 12-14m Stores Meat 400-450kg 800£
  - 12♀ 12-14m Stores Meat 400kg 750£

100 Ewes → 70£ 80 Ewes

10 Rams Texel Charolais 3/year

400 Ewes Mules × 1,7 lamb

Born 03-04-05 → double inside ...

Sold 06 07 09 10 12 03

	05	15→15	65	65	100
%					
per head	90£	70£	70£	70£	75£	95£

Sold as store lambs

Diet:

Ewe lamb
Ewe +
Lamb
Old lamb
Suckler Cow Calves Yearlings

Bulling

	01	02	03	04	05	06	07	08	09	10	11	12
Ewe lamb	GRASS				Mg cake ewe silage			GRASS PP			LAB TACK	
Ewe +												
Lamb						GRASS molasses						
Old lamb								GRASS molasses sheeplick				
Suckler Cow	GRASS											
Calves	(1-2kg cake 12% prot lactation) bolus minerals					GRASS						18kg haylage ...
Yearlings						calf mix 0,5→1kg						...
	haylage 10-12kg 12% cake 1-2kg					GRASS						

Acreage:

50a
185a
- PT
- RG + WC
- 7year & plus

15a Reseeded

Grass TP RG+WC >7yr

8-9 t → 15t/a → 5-6 t

- Silage Gaund:
  - 1x) 90a 2x) 60a
- Grazing platform
  - 95a ⊕ 15a ⊕ 50a
  - Suckler Cows near home

0,5 LCU/ha

Fodder:

Lime 4-5yr 2T/a

	01	02	03	04	05	06	07	08	09	10	11	12
Reseeded	grazed ...							Fymn Herb	Plant			
Silage grand						(F)60U Bales		Bales		Fymn		
Grazing grand						(F)45U Bovine		Top/Herbs				
						grazing 8lots 7d/field 1month return						
PP						(F) 30U Sheep		Grazing season bovine Free roaming Top/Herbs				

PS13a: 1000 late lambing ewes with suckler cows on big ridges

General:
- 400-550a (50% Rented) FBT
- 1000-1500 Ewes
- 2 holdings
- 1 family + 0,5 ETP
- 80% Ploughable

Equipment:
- concreted cubicles for suckler cows
- straw shredder
- tractor 2 (100, 120 Hp)
- Slurry pit 300 Kgal
- loose housed shed
- mower
- JCB
- Sheep / Cattlebox
- Quadbikes
- ⊕ 1 post hoylift
- trailers

Herd: 2500 [100 ♀/M] → 200 ♀ 50 ♂/h → 1000 Ewe Llyn Mules → ×1,5 lamb

Rams: 40 ♂ Texel / Char 10-11-12 Tupping

5 incalved heifers

Bull 2x Lim

50 Suckler Cows Limousin

04-05 inside calving

900 ♀ - 1K ♀ → 5 abattoir 800-900 kg

04 | mid 04 | 05 Born

outside ... peak ...

Sold mid 06 | mid 09 | - 18 | 04(+1)

20% 90 ♀ ↓ 60% 70 ♀ ↓ 80% 75 ♀ & 100% 85 ♀ ↓

⊖ mollys } → mixed

24 ♂ 24mn 380 kg 360p/kg

24 ♀ Fat 24mn 330-350 kg 350p/kg

Cake: Home mix: 12% prot • protein concentrate 10% - barley

Lime 50-60a/year

Acreage: 450a

- 100a PP humidd slopes
- 30a Spring Barley
- 50a IRG 3-4yr
- PT RG 300a

Grass PT >7yr RG + WC IRG → Spring Barley 30a

↳ Silage Graund: 70a 1x) cut end 06 35% DM 10T/yr IRG
70a 2x) Cut mid 08 40% DM 8T/yr RG

↳ Grazing: • 100a PP ⊖ Fertilisation } mixed grazing 1) Lambs 2) Suckler Cow 3) Ewes
• 280a Fertilized

Diet: 01 02 03 04 05 06 07 08 09 10 11 12

ewes ⊕ lamb	GRASS		
ewes	TS	GRASS + cake 0,5 kg/j	GRASS
lamb			GRASS
old lamb	GRASS		
Suckler cow	• haylage 15-20 kg bolus	GRASS ⊘ 1,0 kg home mix	...
Calves	• grass silage 15% 0,5-2 kg home mix	GRASS 2 kg home mix	
Yearling Heifers	• grass silage 15% 3-4 kg home mix	GRASS 1,5 kg home mix	...

AS TACK SHEEP

Fodder 01 02 03 04 05 06 07 08 09 10 11 12

Spring Barley	Grass Grazed	Hom Herb	FU 50U Plant Herb ...					Plant Haw				Grazed ...
GRASS LAND	Ewes...	FU 50U		Silage	FU 30U			Bales (Hom)				REST
	Lambs... Old			1/3 wk E+L 100 Grps	FU 20U			'Lambs				
PP	Grazed... 1/month 2 groups							Ewes 70 E + Bovine 1				REST

1,5 LCU/ha

SP13b: 2000 early lambing ewes with Suckler Cows and Crop on big ridges

General:
- 1000-1300a (50% Rented) FBT,,
- 2000-3000 Ewes • 2 holdings
- 1 ETP & 4 Family + 1 Casual
- 90% Playable • 10% PP humide

Equipment:
- loose housed sheds 1000 Ewes same time - straw shedder
- wagon mixer • tractor 3 (150-130-100)
- Fert drill • Soilwork tool • JCB • Skidsteer
- Topper • 1 pair haykit • trailers & cattlebox
- sprayer • quadtrailer

Head:

Rams: 55
Texel/Char 4yr
Suffolk 1yr
08-10 Tupping

2000 Ewes Suffolk → 200 E. 05↑ 60£
350♀ Ewes
× 2 lamb/Ewe

end 01 | 02 | 03 (peak) | end 03 | born
05 | 06 | 07 | 08 | 09 | 10 | Sold

"singles" 15% 105£
90£ 85£ 75£ 70£ 70£ × 1,8 Lamb/Ewe
30% (peak)* 75%. 90%. 100%.

Bull 2x Lim

50 SC Lim
04-05 outside calving
5 Calved Heifers
900£ 800-900kg 5 abattoir

24♂ 24♀
24♀ → 24 m Fat ♀ 330-350kg 350p/kg
12m ♂ Meat 450kg 1,0K£

Diet:

LAMBING 12 01 02 03 04 05 06 07 08 09 10 11 12
Weaning
Tupping

- inside ewes: grass silage 1,5; maize silage 1,5; 1 kg Cake 10%
- ewe & lamb >3-4d/lwk: lamb mix 0,5→1kg (bale); GRASS; Shearing
- ewe (molly) lambs: TS; GRASS; AS TACK SHEEP; milk powder lamb mix 1kg ...; GRASS lamb mix 0,5kg; end
- ewe lamb: TS; GRASS; cake 0,5kg; TS
- suckler cows: grass silage bolus → haylage; GRASS
- Calves: calf mix 12%. Prot 1kg
- Yearlings: grass silage clamp; 1,5kg cake 15% prot; GRASS 0,5kg cake
- Heifers 2: grass silage 1/2 20kg; maize silage 1/2 25kg; 1,5kg cake 12%; GRASS

Acreage: 1000a

TP IRG or RG early
Rent out
PP 100a

"Silage Ground":
2x Cuts: end 06 180a

PT 5yr GRASS 820a

Maize 50a → sold 40a
PdT 60a
Winter wheat 50a → sold 40a

Homestead

- Grazing area: Mix Bovines & Ovines 700a } 200 x 10 grps

Fodder:

Lime 1T/a 200a/year

01 02 03 04 05 06 07 08 09 10 11 12

15T 30% Maize (PdT)
3T/a Winter wheat
GRASS land

grazed sheep ... Herb Fert Plant Herb ... Harv ...
... PdT
.. F 30U Herb; F Short Fongi Fongi; Harv; Reseed ... Grazed ...
Set Stock; F 45U; Ens F 30U; F 30U Bales; REST
60-70a 3wk; 40-50a 3wk; 40a 3wk; 50a 3wk ...

1,25 LCU/ha

PS12c: Organic Suckler Cows farmer producing 30 month old beef on Old Red Sandstone – Big Ridges

General:
- 400-500a (25% Rented)
- 80-100 SC Continental breed
- 2 Family + 0,5 Worker
- 5% < PP

Equipment:
- loose housed sheds and cubicles sheds (straw & sawdust mats)
- Tractor 3 (180, 150, 100Hp) with front loader
- strawblower . JCB . soilwork tools . Quadbike
- Skidsteer . Muck spreader . Mower/Topper.
- (silage kit) (room enough for bailing inside)

Herd:

Limo 80 SC → 8 680kg 900£ ♀

Bulls 2x
Charolais 4yr
Bull Limo 2yr

2yr ♀ 8

Calvings → 1/3 Aut, 2/3 Spring

[Bw 400 kg 380 ♂ CS
470p/kg 30m]

30 ♀ Bw 380kg
460p/kg 30m

[12mm Stores ♂ 20 CS
350kg 750-800£]

30m Fat ♂ 20
350kg Bw 465p/kg

Acreage: 430a

10a Stubble turnips
30a Wholecrop
15a PP
GRASS
TP
Syeau+

Chicken Muck 100T → Fym*

Wholecrop Barley & Peas
Turnips
TP Syeau+
RG + WC
+ Perennials
30%

Silage grazing
1x) 180a 2x) 160a } Clamp / Clamp & Bales

Grazing: 200a + 15a PP

Diet:

	01	02	03	04	05	06	07	08	09	10	11	12
	Bulling (in)			Culled	Bulling (out)							Culled
Suckler Cow	haylage bolus 30kg			GRASS (turnips) GRASS (PP)						(turnips) silage 35kg bolus		
Calves	Weaned 2	calving 1								calving 2		Weaned 1
Yearlings	grass haylage 5-8 kg/d cake 10-12% 1kg			GRASS								grass silage 20 kg/d cake 15% 1kg
2year old	7kg who cake 15% 1kg			GRASS								grass silage 25 kg/d cake 15% 2kg 10kg who

Fodder:

	01	02	03	04	05	06	07	08	09	10	11	12
						Lime						
Turnips 20T/a	GRASS					S1 Fym	Cul Plant			grazed		
Wholecrop 9T/a 35%			Fym*	Undersow Plant					Who	Grazed		
Silage 11T/a			S1 Fym*				Fym/S1 Silage		S1P/Bales	Grazed		
Grazing Platform 3T/a	S1			S1	paddock system 3wk/return 225a			1 month/return 215a		245a	>300a	S1
2T/a PP...												

1,4 LCU/ha

SP10e: Organic Suckler Cows and Sheep farmer (Storecattle)

Org

General:
- 120 - 200a (0% Rented) or 100% AHA
- 1,5 Family
- 30→40sc
- 20% Non ploughable
- 30% Glas-Tir

Equipment:
- Loose housed shed - straw
- straw shredder
- tractor 2x (100 Hp, 120 Hp) Frontloader
- Mower
- Skidsteer
- Quadbike
- trailers
- Cattlebox

Head:

Bull Limo 2-3yr (AI WB)

calving 04-05 outside

40 SC Welsh Black X

2-3 800-900£ 600 kg

2years old 3♀

11-12m old ♂ CS 350kg 800£ stores 15 Org

♂ 12 30m old CS 350kg Bw 465p/kg Org

♀ 10 30m old 300kg Bw 460p/kg Org

Rams x5 1yr

200 E Suffolk Texel

20 Ewe Lambs

x1,3

20 Culled 75£07

02 03 Born

inside 5-4d tot

06 08 09 03 Sold

30% 25% 15% 30%

95£ 85£ 80£ 100£ Org

Diet:

Tupping ←---→ Rams ←---→

	01	02	03	04	05	06	07	08	09	10	11	12
Ewe	Fresh grass							GRASS PP				
Ewe & Lamb	haylage	Fresh grass				GRASS 2nd quality						
Lamb								GRASS 2nd quality				
Old Lamb	GRASS Fresh											
Suckler Cow	haylage 20kg 18				GRASS TP 1st quality (turnips 2,5kg)					... Weaned		
Calf						Milk → GRASS						
Yearlings	haylage 10 kg				GRASS PP					...		
2yearold	haylage 15-18kg				GRASS 1st quality					...		

Acreage: 180a 30a

PP

PP use in Glas Tir 15a

10a Turnips

TP long term lay RG + WC 10yr & ⊕

Turnips → (grass 1year ⊕)

Silage ground:
1x) 90a Hay Meadow Bales

Grazing: ① Bovine 1week ② Sheep 1week

Fodder:

Lime

	01	02	03	04	05	06	07	08	09	10	11	12
Turnips	grazed ...						Furrow ↓ Plant					
Silage ground	↑ Grazed	↑ ↓ Plant (SI)					grazed					
Grazing	Sheep			Bales			grazed			Sheep		
PP	Sheep		Suckler Cow									
			2yearold		"Top"		"Top"		Furrow			
			Yearlings ...				"Top"		"Top"			

1,1 LCU/ha