The Economics of Peasant Families

By default, *ACKS* assumes an agrarian economy where peasants generate revenue by laboring on the domain's lands, producing wheat, barley, and other grains; milk, meat, wool, and other animal products; and various ancillary domestic goods such as ale, timber, clothing, and furniture. From the lord's perspective, this is collected in the form of land value, service value, and tax value, typically totaling 12gp per family per month. But what's going on at the level of the peasant family?

Production

A typical peasant family manages 30 acres, with 20 acres farmed and 10 acres fallow each year. Each year, each of the 20 farmed acres is seeded with 2 bushels of grain. Each farmed acre then yields 10 bushels of grain. 2 bushels must be set aside for next year's seed, so the result is a 4:1 yield of (10 – 2) 8 bushels per acre, or 1 quarter per acre. Therefore, 20 acres yields 160 bushels or 20 quarters of grain. A quarter of grain costs 4gp in *ACKS*. Therefore, the peasant's farmland produces (20 acres x 1 quarter/acre x 4gp/quarter) 80gp per year.

Finally, the family manages 1 ox, 3 cows, 1 pig, and 32 sheep. Each ox and cow requires 1.33 acres of pasture. The pig requires no acreage, as it is fed from fallen nuts and farm refuse. One sheep may graze in each ox or cow's acreage; the other sheep require 0.167 acres of pasture each. The peasant family therefore requires [(1 x 1.33) + (3 x 1.33) + ({32-4} x 0.167)] 10 acres of pasture for its livestock – the same 10 acres it leaves fallow each year.

The ox is used to plough the field, and its value is already represented by the yields noted above. The 3 cows produce 10.41gp of revenue each. The pig produces 1.14gp of revenue. The 32 sheep produce 1.58gp of revenue each. Total revenue for the field is therefore [(3 x 10.41) + (1 x 1.14) + (32 x 1.58) 82.93gp. For ease, we round to 83gp.

Across its members, a peasant family has 500 days of labor available. The family first attends to its crops and animals, then its garden, and thereafter performs unskilled labor for other purposes.

The labor of farming can be divided into plowing, reaping, harvesting, and threshing. Plowing an acre takes 1.1 days of labor, or 22 days for 20 acres. Reaping an acre requires 1.5 days, or 30 days for 20 acres. Harvesting an acre requires 1.4 days, or 28 days for 20 acres. Threshing 4 bushels requires 1 day, or 40 days for 160 bushels. In total, farming 20 acres requires (22 + 30 + 28 + 40) 120 days of labor, or about 6 days per acre.

The labor of animal husbandry is dependent on the livestock. Each cow requires 5 days of labor annually. Each pig requires 3 days of labor annually. Each sheep requires 1.33 days of labor annually. A farm with 3 cows, 1 pig, and 32 sheep uses [(3 x 5) + (1 x 3) + (32 x 1.33)] 60.56 days of labor, or about 6 days per acre.

The peasant family therefore has [500 – (120 + 60)] 320 days of labor available after tending to crops and animals. Unskilled labor is worth 1sp per day, so this yields an additional 32gp for the household.

The total value produced is 80gp from crops, 83gp from livestock, and 32gp from other labor, for a total of 195gp per year. With 12 months per year, the peasant family produces 16.25gp of crops, milk, wool, meat, and goods per month.

Consumption

ACKS is agnostic with regard to whether any individual peasant family is an owner, renter, or serf of its land. The economic system simply assumes that most of a peasant family's production is extracted by landlords and tax collectors in some manner, such that the family is able to maintain only a subsistence lifestyle.

A peasant family requires a minimum of 11,000 calories per day, with 10,000 from bread and 1,000 from meat. A one-pound loaf of bread provides 1,000 calories per day. A bushel of wheat produces 72 one-pound loaves of bread. As each bushel costs (4gp/quarter / 8 bushels/quarter) 0.5gp, each loaf of bread costs 0.69cp. Therefore each family needs (7 x 0.69) 4.83cp per day for bread. 1,000 calories of beef, pork, or milk costs 4cp, so each family spent another 4cp per day. In total, the family needs 8.83cp per day, or 264.9cp per month, or 2.65gp.

Historically the cost of food represented at least 60% of total costs for a peasant household. Using this as a baseline, we can calculate that total subsistence consumption could not exceed 2.65gp/0.6, or 4.41gp per month. We shall set the value at 4.25gp per month. The peasant family consumes (4.25gp – 2.65gp) 1.6gp of goods other than food per month. In total it consumes (4.25gp/month x 12 months/year) 51gp per year.

If the family produces 16.25gp per month, and subsists on 4.25gp per month, then the monthly surplus remaining for landlords and tax collectors is 12gp. In ACKS, this is represented with the tax, service, and land values generated by each peasant family, which average 12gp per month for average land (land value 6gp). About 75% of the peasant's production is thus claimed by the ruler.

Note that if the family were to abandon its farm to work as unskilled labor, it would have a full 500 days of labor available. The wages of unskilled labor are 1sp per day, so the family might hope to earn 500sp per year, that is, 50gp per year or 4.16gp per month. Thus, even assuming full employment, a laborer family is worse off than a peasant family.

In most cases, the peasant family will enjoy an even higher standard of living, as the local lord returns a portion of his taxes and rents in the form of seasonal festivals. Since the ruler spends 5gp per family per festival, that works out to (5gp/festival x 1 festival/season x 1 season/3 months) 1.67gp per month returned to the family. The peasant family thus may consume as much as 5.92gp per month.

Returns from Livestock

Calculating revenue from livestock is complicated by the fact that livestock are born, reproduce, and die. To address this dynamic, we developed the concept of an **equilibrium herd**. The equilibrium herd is a set of animals of sufficient size to maintain its numbers year over year while producing milk, meat, wool, and other goods at a stable level. By using an equilibrium herd, average revenue per animal can be calculated as the revenue produced by the equilibrium herd divided by the number of animals in the herd. Using an equilibrium also enables us to assess the return on investment in livestock, to see how it compares to implied return on investment in *ACKS* of 3% per month (for more on the implied return on investment in *ACKS,* see *The Secret Ratio* at http://www.autarch.co/blog/secret-ratio).

Child-aged livestock have been priced at 50% of adult price, while adolescent livestock are at full price. Baby, child, and adolescent livestock have pelts and meat worth 25%, 50%, and 75% of the value of adult livestock, but adolescent males are treated as adult females due to dimorphism. Pasture is priced at 15gp per acre (arable farmland is 50gp per acre).

CATTLE

An equilibrium herd consists of 16 cattle, including 8 adult cows, 2 heifers (adolescent female cows), 2 bullocks (adolescent male cows), 2 bull calves (child male cows), and 2 cow calves (child female cows). The adult cows have access to a bull (not included in the herd). Every year, the following occurs:

- Each head of cattle receives 5 days of labor costing 1sp per day, for a total of (16 x 5 x .1) 8gp.
- Each of the 16 heads of cattle grazes on 1.33 acres of pasture, for a total of 21.28 acres.
- Each of the 8 milk-cows has a 70% annual chance of giving birth to a calf, which has a 70% chance of surviving to mid-year. Therefore there are (8 x .7 x .7) 4 calves by mid-year, of which 2 are bull calves and 2 are cow calves.
- 6 of the milk cows produce 125 gallons of milk each. The 2 oldest milk cows and the 2 heifers produce 112.5 gallons of milk each. Total milk production is [(6 x 125) + (4 x 112.5)] 1,200 gallons. Milk is worth 1sp per gallon, so the herd produces 120gp worth of milk.
- The 2 oldest milk cows and the 2 bullocks* are slaughtered for beef and leather. Each produces 250lbs of beef valued at 4cp per pound, or 10gp, for 40gp worth of meat total. Each produces 25lbs of leather valued at 6.6cp per pound, or 1.65gp, for 6.6gp worth of leather total.
- The 2 heifers develop into milk-cows.
- The 2 bull calves develops into bullocks.
- The 2 cow calves develop into heifers.

At year's end, the herd has returned to its equilibrium of 8 milk-cows, 2 heifers, 2 bullocks, 2 bull calves, and 2 cow calves. Total production is (120gp + 40gp +6.6) 166.6gp and total cost is 8gp, for profit of 158.6gp. On average, revenue per head of cattle is (166.6/16) 10.41gp and labor cost is (8/16) 0.5gp.

Return on Investment: Purchasing 8 milk-cows, 2 heifers, 2 bull calves, and 2 cow calves costs [(8 x 10) + (2 x 10) + (2 x 5) + (2 x 5)] 120gp. Pasture can be purchased at 15gp per acre, so purchasing 21.28 acres of pasture costs 319.2gp. Total investment is therefore 439.2gp, rounded to 440gp. According to *ACKS* secret ratio, that should yield 13.33gp per month or 160gp per year profit. At 158.6gp per year, cattle herding yields 99% of the value predicted by the secret ratio.

Caloric Return on Acreage: A gallon of cow milk has 2,400 calories and a pound of beef has 1,000 calories. Caloric production is therefore (1,200 x 2,400) 2,880,000 calories of milk and (250 x 4 x 1000) 1,000,000 calories of beef, or 3,880,000 calories. This takes 21.28 acres of pasture. In contrast, 21.28 acres of farmland will produce 21.28 quarters of wheat. Each quarter of wheat consists of 8 bushels, each of which produces 72 loaves of bread worth 1,000-calories each. Therefore a similar acreage of farmland will produce (21.28 quarters x 8 bushel/quarter x 72 loaves/bushel x 1000 calories/loaf) 12,257,280 calories. Raising cattle is only about 30% as efficient in producing calories as farming.

Terrain: Cattle can only be reared in Clear, Grass, Scrub, Woods, and Hills terrain. They cannot be reared in Mountains, Barrens, Desert, Swamp, or Jungle terrain.

Mixed Grazing: For each cattle grazed on a farm, one goat or sheep may be grazed in the same acreage. Each species eats the grasses, shrubs, and bushes it prefers, increasing the efficiency of the pasturage.

GOATS

An equilibrium flock consists of 16 goats, including 8 doe, 2 yearling doe, 2 yearling bucks, 2 doe kids, and 2 buck kids. All the does have access to an uncastrated buck. Every year, the following occurs:

- Each goat requires 5 days of labor costing 1sp per day, for a total of (16 x 5 x .1) 8gp.
- Each of the 16 goat requires 0.167 acres of pasture to graze on, for a total of 2.67 acres.
- Each of the 8 doe has a 70% annual chance of giving birth to a kid, which has a 70% chance of surviving to mid-year. Therefore there are (8 x .7 x .7) 4 kids born, of which 2 are doe kids and 2 are buck kids.
- Each of the 16 goats produces 0.5lbs of fleece worth 5sp per lbs, or 2.5sp per fleece, for a total of (16 x .25) 4gp.
- 6 of the doe produce 22.5 gallons of milk each. The 2 oldest doe and the 2 yearling doe produce 20 gallons of milk each. Total milk production is [(6 x 22.5) + (4 x 20)] 215 gallons. Milk is worth 1sp per gallon, so the herd produces 21.5gp worth of milk.
- The 2 oldest does and the 2 yearling bucks are slaughtered for chevon and leather. Each produces 33lbs of chevon valued at 3cp per pound, or 1gp, for 4gp worth of meat total. Each produces 3.3lbs of leather valued at 6.6cp per pound, or 0.22gp, for 0.88gp worth of leather total.
- The 2 yearling does develop into does.
- The 2 buck kids develops into yearling bucks.
- The 2 doe kids develop into yearling doe.

At year's end, the flock has returned to its equilibrium of 8 doe, 2 yearling doe, 2 yearling bucks, 2 doe kids, and 2 buck kids. Total production is (4 + 21.5 + 4 + 0.88) 30.38gp and total cost is 8gp, for profit of 22.38gp. On average, revenue per goat is (30.38/16) 1.90gp and labor cost is (8/16) 0.5gp.

Return on Investment: Purchasing 8 doe, 2 yearling doe, 2 doe kids, and 2 buck kids cost costs [(8 x 2) + (2 x 2) + (2 x 1) + (2 x 1)] 24gp. Pasture can be purchased at 15gp per acre, so purchasing 2.67 acres of pasture costs 40gp. Total investment is therefore (24 + 40) 64gp. According to the *ACKS* secret ratio, that should yield 1.93gp per month or 23.27gp per year profit. At 22.38gp per year, goat herding yields 96% of the value predicted by the secret ratio. Goats have a lower return than sheep or cattle, but a higher return than pigs.

Caloric Return on Acreage: A gallon of goat's milk has 2,250 calories and a pound of chevon has 650 calories. Caloric production is therefore (240 x 2,250) 540,000 calories of milk and (4 x 33 x 650) 85,800 calories of chevon, or 625,800 calories, over 4 acres. In contrast, 4 acres of farmland will (4 quarters x 8 bushel/quarter x 72 loaves/bushel x 1000 calories/loaf) 2,304,000 calories, or 3.68 times as much. Raising goats is only 27% as efficient in producing calories as farming. They are less calorically efficient than pigs or cattle, but more calorically efficient than sheep.

Terrain: Goats can be reared in Clear, Grass, Scrub, Woods, Mountains, Hills, or Barrens terrain. They cannot be reared in Swamp, Jungle, or Desert terrain.

Mixed Grazing: For each cattle grazed on a farm, one goat or sheep may be grazed in the same acreage. Each species eats the grasses, shrubs, and bushes it prefers, increasing the efficiency of the pasturage.

Sheep

An equilibrium flock consists of 16 sheep, including 8 ewes, 2 yearling ewes, 2 yearling rams, 2 ewe lambs, and 2 ram lambs. All the ewes have access to an uncastrated ram. Every year, the following occurs:

- Each sheep requires 1.33 days of labor costing 1sp per day, for a total of (16 x 1.33 x .1) 2.13gp.
- Each of the 16 sheep requires 0.167 acres of pasture to graze on, for a total of 2.67 acres.
- Each of the 8 ewes has a 70% annual chance of giving birth to a lamb, which has a 70% chance of surviving to mid-year. Therefore there are (8 x .7 x .7) 4 lambs born, of which 2 are ewe lambs and 2 are ram lambs.
- Each of the 16 sheep produces an average of 1.6lbs of fleece, worth 5sp per lbs, or 7.5sp per fleece, for a total of (16 x .75) 12gp.
- 6 of the ewes produce 9 gallons of milk each. The 2 oldest ewes and the 2 yearling ewes produce 8 gallons of milk each. Total milk production is [(6 x 9) + (4 x 8)] 86 gallons. Milk is worth 1sp per gallon, so the herd produces 8.6gp worth of milk.
- The 2 oldest ewes and the 2 yearling rams are slaughtered for mutton and leather. Each produces 25lbs of mutton valued at 4cp per pound, or 1gp, for 4gp worth of meat total. Each produces 2.5lbs of leather valued at 6.6cp per pound, or 0.165gp, for 0.6gcp worth of leather total.
- The 2 yearling ewes develop into ewes.
- The 2 ram lambs develops into yearling rams.
- The 2 ewe lambs develop into yearling ewes.

At year's end, the flock has returned to its equilibrium of 8 ewes, 2 yearling ewes, 2 yearling rams, 2 ewe lambs, and 2 ram lambs. Total production is (12 + 8.6 + 4 +0.6) 25.2gp and total cost is 2.13gp, for profit of 23.07gp. On average, revenue per sheep is (25.2/16) 1.58gp and labor cost is (2.13/16) 0.13gp.

Return on Investment: Purchasing 8 ewes, 2 yearling ewes, 2 ewe lambs, and 2 ram lambs cost costs [(8 x 2) + (2 x 2) + (2 x 1) + (2 x 1)] 24gp. Pasture can be purchased at 15gp per acre, so purchasing 2.67 acres of pasture costs 40gp. Total investment is therefore 64gp. According to the *ACKS* secret ratio, that should yield 1.93gp per month or 23.16gp per year profit. At 23.07gp per year, sheep herding yields 99.6% of the value predicted by the secret ratio. Sheep have the highest return on investment of any livestock.

However, over 45% of a sheep's revenue is derived from its wool. Annual consumption of wool was historically around one pound per person in pre-modern times. Since each sheep produces more than a pound of wool annually, a farmer with more than a half-dozen sheep must be producing wool for sale. Sheep herding will therefore only truly realize its value when a well-developed wool export market exists. Moreover, sheep herding is quite inefficient as a means of producing calories. Therefore, even if an export market exists, land must be widely available relative to the size of the populace in order for enough to be available as pasture for sheep. The most well-known historical confluence of these requirements is England in the centuries after the Black Death.

Caloric Return on Acreage: A gallon of sheep's milk has 2,400 calories and a pound of mutton has 1,000 calories. Caloric production is therefore (96 x 2,400) 230,400 calories of milk and (4 x 33 x 1,000) 132,000 calories of mutton, or 362,400 calories. This takes 2.67 acres of pasture. In contrast, 2.67 acres of farmland will produce (2.67 quarters x 8 bushel/quarter x 72 loaves/bushel x 1000 calories/loaf) 1,537,920 calories, or 4.24 times as much. Raising sheep is only 24% as efficient in producing calories as farming.

Terrain: Sheep can be reared in Clear, Grass, Scrub, Woods, Mountains, and Hills terrain. They cannot be reared in Swamp, Barren, Desert, or Jungle terrain.

Mixed Grazing: For each cattle grazed on a farm, one goat or sheep may be grazed in the same acreage. Each species eats the grasses, shrubs, and bushes it prefers, increasing the efficiency of the pasturage.

Swine

An equilibrium herd consists of 11 swine, including 1 sow, 5 pigs, and 5 piglets. The sow has access to a boar. Every year, the following occurs:

- Each swine requires 3 days of labor costing 1sp per day, for a total of (11 x 3 x .1) 3.3gp.
- Each swine requires 0.1 acres of pasture to graze on, for a total of 1.1 acres.
- The sow gives birth to a litter of 6 piglets, of which 5 survive to mid-year.
- The 5 pigs are slaughtered for pork. Each produces 83lbs of pork valued at 3cp per pound, or 2.5gp, for 12.5gp worth of meat total.
- The 5 piglets develop into pigs.

Total production is 12.5gp worth of meat and total cost is 3.3gp, for a profit of 9.2gp. On average, revenue per pig is (12.5/11) 1.14gp and labor cost is (3.3/11) 0.3gp.

Return on Investment: Purchasing a sow and 5 piglets costs [3 + (5 x 1.5)] 10.5gp. Pasture can be purchased at 15gp per acre, so purchasing 1.1 acres costs 16.5gp. Total investment is therefore 27gp. According to the *ACKS* secret ratio, that should yield 0.82gp per month or 9.82gp per year profit. At 9.2gp per year, swine herding yields 94% of the value predicted by the secret ratio. Swine have the lowest return on investment of any livestock.

Caloric Return on Acreage: A pound of pork has 650 calories. Caloric production is therefore (5 x 83 x 650) 269,750 calories over 1.1 acres. 1.1 acres of farmland will produce 1.1 quarters of wheat, yielding (1.1 quarters x 8 bushels/quarter x 72 loaves/bushel x 1000 calories/loaf) 633,600 calories, or 2.34 times as much. Raising swine is 42% as efficient in producing calories as farming. Swine are thus the most calorically-efficient livestock. Since a single pig requires no acreage, the easiest way for peasants to introduce meat into their diet is by pig farming.

Terrain: Swine can be reared in Clear, Grass, Scrub, Woods, Hills, Swamp, and Jungle terrain. They cannot be reared in Mountain, Barren, or Desert terrain.

Pannage: To represent the practice of allowing peasant-owned swine to feed on fallen acorns and nuts in nearby woodlands, each peasant family may rear a single swine without allocating acreage per family.

Note: Note that in *Lairs & Encounters,* meat is valued at 0.3gp per stone, or 30cp per 15lbs, or 2cp per pound. However, in *ACKS*, preserved meat costs 200gp per 80 stone. Therefore each stone of preserved meat costs 2.5gp. A stone on the mercantile tables typically represents 15lbs., so each pound of preserved meat costs 0.17gp or 17cp – a huge disparity from the cost in *L&E*! However, preserved meat such as jerky weights 30% of fresh weight, so each pound of preserved meat really represents 3.33lbs of fresh meat. Fresh meat therefore cannot cost more than (17/3.33) 5.1cp per pound. The labor and materials used in the preservation process have to cost something!

Historically, meat has been estimated at 5 to 6 ½ times as expensive as wheat on a caloric basis. Since a 1,000-calorie loaf of bread costs 0.69cp, we should expect a 1,000-calorie serving of meat to cost 3.45cp to 4.49cp. Mutton and beef have about 1,000 calories per pound, so they should cost about 3.45cp to 4.49cp. Chevon and pork have about 650 calories per pound, so they should cost 2.25cp to 2.93cp per pound.

In these rules, we assume that beef and mutton costs 4cp per pound, chevon and pork costs 3cp per pound, and other meat costs 2cp per pound.