Motivation for increased production among Norwegian farmers

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Abstract: In the wake of the latest global food crisis the Norwegian government has stated a goal of 20 per cent increased food production by 2030. The goal is ambitious, and questions can be raised about both the realism of the goal and the strategies to get there. A critical theme is the production choices and strategies taken on the farm level. To what degree are farmers seeking compatible goals? The literature suggests that a complex set of mechanisms is involved in this. In the paper we present results from a representative biennial survey (2002-2012) among Norwegian farmers about their plans for future production. Do they plan for increased or decreased production or status quo? Have the plans changed over time? Moreover, how do the plans vary with socio-economic factors such as farm size, type of production and household income characteristics? What is the impact of the regional localization of the farm? The study is part of a larger integrated research project (AGROPRO) involving agronomic scientists, economists and social scientists. The overall goal in the project is to develop agronomic practices that contribute to increased and sustainable food production and to identify drivers and challenges for implementing this.

Keywords: Agriculture; increased production; farmers; plans; Norway

Introduction

A shift can be observed in agricultural policies and in the rhetoric on agriculture around the world after the food crisis in 2008 (Almås and Campbell, 2012; Marsh, 2010). The term neo-productivism has been used to describe the shift. One of the key features of this shift is that rhetoric, policy aims and policy tools turn from keeping production down to increasing production. The shift has to do with observed and expected changes in global population, climate, use of land for bioenergy production, and consumption patterns as well as production faults due to draught in major agricultural producing countries (Schneider et al., 2011). Indeed, a policy argument and motivation among farmers for increased food production is food security, although the sustainability of some strategies for increased food production has been questioned (Fish et al., 2013; Lawrence et al., 2013; Marsh, 2010; Rosin, 2013; Tomlinson, 2013). In terms of food security food production is part of a larger context where such factors as feed-to-food efficiency in animal food production, diet and food wastage also play a role (Wirsenius et al., 2010). Even if these factors are not the primary concern in this paper, they indicate that increased food production can come about in various ways and has different aspects. This view accords with Burton and Wilson (2012) who argue that there are multiple forms of new productivisms in contemporary agriculture, and view neo-productivism as an umbrella term. Nevertheless, a key issue in understanding how a neo-productivist ideational regime may translate into actual agricultural practices is the farmers' willingness and motivations for increasing their production.

Following from this is that increased agricultural production can be linked to production on national level as well as on farm level. Increased production on a national level can be reached in various ways, and not all farmers have to expand. The recent Norwegian target of a 20 per cent

increase in agricultural production within 2020 concerns primarily the national level, but there are also goals for regional and structural distribution of production (Landbruks- og matdepartementet, 2011-2012). Therefore, it is interesting to have a clearer picture of what type of farms and farmers that most probably will increase production.

Bjørkhaug et al. (2012) found that the rising food prices caused be the food crisis in 2008 led to more optimism among Norwegian farmers, more willingness to invest in farming and clear signs of a "repositioned productivsm". In other words, a global change had implications on the view on production among farmers. In this paper we contribute with an empirical study shedding light on to which degree neo-productivism represents anything new on the farm level and if this is a lasting tendency. Can we see a more production-oriented attitude among farmers, and if so, what are the drivers behind production orientation among farmers?

Many factors may impact on production and production plans on a farm. Studying efficiency among Irish dairy farms Kelly et al. (2012) found a variety of management and demographic variables to have an impact, e.g. milk quality, number of grazing days, soil quality and membership in discussion groups. Some of the same connections were found in Swedish studies (Hansson, 2007). Geographic location, soil and climatic conditions and business culture affect economic performance. Discussing production with someone has an impact on farm performance. Moreover, size of fields and distance to fields have impact. Increased size of a farm may lead to economies of scale and hence be a motivation for increased production on farm level. Such up-scaling may require renting of additional farmland. In many cases available land is scattered, which may lead to less economies of scale being obtained (Forbord et al., 2014; Jabarin and Epplin, 1994; van Dijk, 2003). On the other hand, operating land in different areas may also open opportunities for risk reduction, improved crop scheduling and increased ecological variety (Demetriou et al., 2012).

Other aspects regard farmers' attitudes and responses to policy and market changes. Bradshaw (2004) investigated the assumption that farmers seek to diversify their operations when government subsidization of agriculture declines. This is based on the observation that (output) specialization is an observed trend of productivism, while (output) diversification is a characteristic of post-productivism. The study found limited empirical support for such a connection, implying that farmers specialize irrespective of government subsidies. This finding can be seen against a comparative study of farmers in EU member countries (Gorton et al., 2008), which shows that farmers retain a productivist mindset and wish to maintain an agricultural focus irrespective of the orientation of agricultural policy. However, this does not mean that versatility of production is irrelevant. E.g. farming systems integrating crop and livestock production may impact positively both on productivity, sustainability and business risk (Bell et al., In Press). Dogliotti et al. (In Press) report from a project in Uruguay where strategies on arable farms were redesigned from intensification and specialization to introducing crop rotations, cover crops, beef-cattle production and manure applications. By this substantial improvements in economic and environmental indicators were achieved. Soil degradation and erosion was reduced, crop yields increased, and farm incomes per capita and per hour enhanced by 50 percent. Farmers considered introduction of 'multi-year planning' as the most important element in the changed strategy. Moreover, a basic criterion for future increased food production is that it must not lead to increased greenhouse gas (GHG) emissions. Bonesmo et al. (2012) investigated 95 arable farms (oilseed, barley, oats, wheat) in Norway and found great variations in GHG emissions per unit within and between crops and between different land areas. Moreover, GHG emissions per unit decreased with increased gross margin. According to the authors this shows a significant potential for reduced emissions and that there necessarily is no contradiction between profitability and sustainability.

This review shows that increased agricultural production is a many-sided theme involving different aspects. For farmers increased production may be interesting if this at the least does not nega-

tively affect other variables, such as farm income and soil quality. Sustainability aspects such as GHG emissions must also be taken into consideration as well as other ways to provide food supplies. Moreover, increased food production from agriculture is not simply a question of enhancing agronomic knowledge and developing technology. Human factors and structural factors at farm level such as farmers' motivations and abilities, economic considerations, regional conditions and job opportunities in other sectors are factors that also can be assumed to have an impact. Hence, this paper explores the following two sets of questions:

1. Has there been any development over time among farmers concerning how they view future production on the farm? Specifically, how has the proportion of farmers foreseeing increase in production, decrease in production and no change in production developed over the recent years?

2. What factors are related to different views among farmers concerning future production? Specifically, has the size of farm, type of production, share of household income stemming from farming and regional localization any impact on future production plans on the farms?

Data and method

The data used in this paper comes from the biennial study, "Trends in Norwegian agriculture". This is a survey that has been performed every second year since 2002. Each time approximately 1600 to 1700 farmers answer the questionnaire. The response rate has been just above 50 per cent each year. The data has been checked and found representative in key variables related to farm size, production types and -levels, etc. Thus, the data in general can be seen to give a representative picture of Norwegian agriculture. The questionnaire consists of questions aimed at providing variables on personal background issues such as age, gender, marital status, education etc.; farm features as regional location, size, production types and levels, etc.; the economic situation of the farmer and the farm family household; and a series of variables mapping attitudes, beliefs, perceived prospects and plans for the farm in the future.

In this paper we primarily want to elaborate on the future plans of Norwegian farmers in relation to a series of structural features. The methods performed here are first to present descriptive statistics on the farmers' future plans, and thereafter simply to map out the co-variations between the patterns of future plans and a series of structural variables such as farm size, production type, share of farm family income from farming and region.

Results

Farm production – changes in expectations over time

We start with how farmers' view of future production has changed over the period 2002-2012 (Table 1). The basic question was: "Which of the following possible developments are most likely for you and/or your farm the next five years?" There were several options, and the respondents could tick more than one. The options which are relevant and analyzed here are connected to changes in volume of farm production, formulated as "Increased production" and "Decreased production". These options are mutually exclusive. Moreover, a third option was ticking off none of these alternatives, which we interpret as no likely change in production volume, that is, neither increase nor decrease in the extent of farm production.

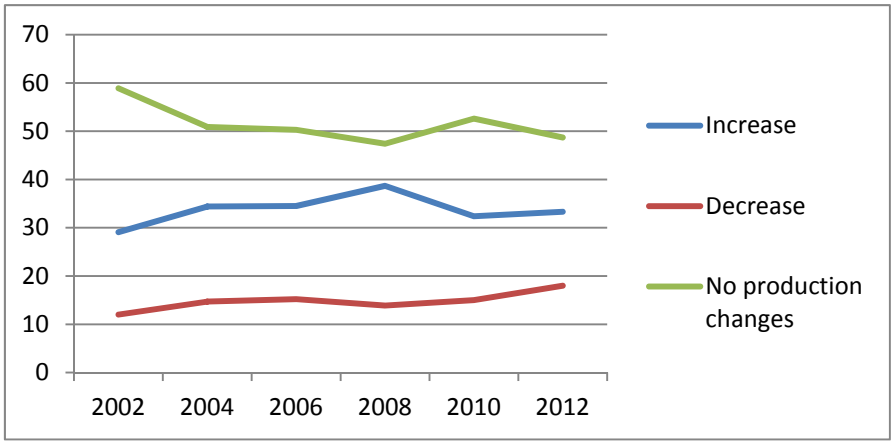
Table 1: Share of farmers foreseeing increased production, no change in production and decreased production respectively for the years 2002-2012.

Year	2002	2004	2006	2008	2010	2012
Production development foreseen						
Increase, %	29.1	34.4	34.5	38.7	32.4	33.3
No change, %	58.9	50.9	50.3	47.4	52.6	48.7
Decrease, %	12.0	14.7	15.2	13.9	15.0	18.0
Total, %	100	100	100	100	100	100
N=	1678	1712	1677	1607	1584	1669

Pearsons chi square: 35.713. Sig: 0.000

The results may be made more accessible in graphical form as in Table 1.

Figure 1: Share of farmers (%) foreseeing increased production, no change in production and decreased production respectively for the years 2002-2012.



These numbers reveal several interesting findings. First, over time there is a slight tendency towards a higher share of farmers foreseeing *decreased* production. The share was 12 per cent in 2002 and 18 per cent ten years later. On the one hand, this indicates a growing pessimism in parts of the farm community when it comes to the possibility to make a living from farming. This development flattened out or made a small drop in 2008, but continued in 2010 and 2012. On the other hand, and contrary to what could be expected based on the above finding, also the share of farmers imagining *increased* production increased, from around 29 per cent in 2002 to 33 per cent in 2012. The increase was especially significant in 2008. However, this was early in the financial crisis and a special year in agricultural markets because international prices peaked for the first time in decades (see e.g. Almås and Campbell, 2012; FAO, 2013). The price change did not impact Norwegian agriculture directly, but the entire agricultural debate was affected by the idea of increasing prices and demand for agricultural products. Third, the category that has diminished in the period is farmers foreseeing *no changes in production*, dropping from around 59 per cent at the beginning of the period to nearly 49 per cent at the end. Overall, the results does indicate a shift, although moderate, from farmers foreseeing status quo in production towards farmers that foresee a change, either in form of reduction or in form of increase. The only deviance from this pattern is the period just after the start of the financial crisis (2008-2010), when the tendency to foresee increase in production dropped and the tendency to imagine status quo as well as reduced production increased. The finding corresponds with Buttels (1982) now classical rural-sociological notion of the "disappearing middle".

The numbers indicate that there is a moderately growing productivist impulse among farmers, but also that this is accompanied by an increase in farmers that foresee production decrease. However, these numbers alone say nothing about the structural distribution of foreseen production developments. Thus, from this analysis of change over time we go over to look at factors that can explain the variation in views concerning future production on farms. We then focus on the last year in the period, 2012, concentrating on the options 'foreseeing increase in production' and 'foreseeing decrease in production'. However, the rest of the shares in the tables below (up to 100%) corresponds per definition to the category 'no change in production'. We investigate four potential explanatory factors: 1) size of farm in terms of agricultural land, 2) type of production, 3) regional localization, and 4) share of income from farming.

Farm size

It is reasonable to expect that production plans are unevenly distributed between farms of different size. Below we present the farmers' expected developments broken down on size categories of farms.[301] We see that the variations are substantial and statistically significant.

Table 2. Share of farmers foreseeing increased production and decreased production in different farm size categories (ha). Year 2012. N=1669.

Size of farm (ha)	0-0.9	1-1.9	2-4.9	5-9.9	10-24.9	25-50	50-99	100 and over
Increase, %	4.2	4.2	19.5	21.7	29.7	51.0	56.5	55.6
Pearsons chi square: 134.148. Sig: 0.000								
Decrease, %	16.7	29.2	25.2	24.1	19.6	11.5	9.7	14.8
Pearsons chi square: 30.081. Sig: 0.000								

Table 2 shows that view on future production on the farm is highly correlated with farm size in terms of agricultural land. The basic finding is that, the bigger the farm the higher is the share of farmers foreseeing increased production, and vice versa: the smaller the farm the higher is the share of farmers imagining decreased production. The very smallest and largest farms deviate from the pattern when it comes to production decrease expectations. Concerning the largest category (100 ha and over) a higher share of these farms foresee reduction in production when compared to farms in the two categories below (25-99 ha). With respect to the smallest category (0-0.9 ha) these farms have for the most part some form of intensive productions (e.g. fruits and vegetables), if not they would have earned too little to be in position for agricultural subsidies and regarded as active farms. The intensive production can explain why rather few of these farmers foresee reduction in production.

Type of production

When it comes to type of production, we look especially into milk production and grain production as these are the single most important productions in Norway.

Table 3. Share of farmers foreseeing increased production and decreased production in milk production and grain production. Year 2012. N=1669.

	Milk production	Grain production
Increase, %	50.3	24.2
Pearsons chi square: 80.496. Sig: 0.000		
Decrease, %	15.6	11.9
Pearsons chi square: 23.531 (0.001)		

[301] It has to be said that the structure of Norwegian agriculture differs from many other countries. Farms are rather small in a European context. The average farm size now is around 21 ha. This structure is upheld by a substantial level of trade barriers and farm subsidies.

Table 3 shows that type of production is highly associated with farmers' views concerning future production. Approximately every second milk producer foresees increase in production, while only every fourth grain producer foresees this. There are several possible explanations for this. One is that the profitability in grain production is rather low related to milk production. Second, in Norwegian agriculture milk producers are full-time farmers to a larger degree than grain producers. Grain producers in Norway are typically located in regions where there is good access to alternative labour and the size of farms are often not enough to make a living from agriculture alone, implying both that grain producers has less available labour to put in the production and that extra income from agriculture is less important for the grain producers. Third, milk production has long been held down by production quotas; these restrictions are gradually being removed meaning that there might be an unutilized capacity for production on the dairy farms that we don't find on the grain farms. However, there may be other factors involved as well.

Share of household income from agriculture

The third factor we investigate is the share of household income stemming from agriculture (Table 4).

Table 4. Share of farmers foreseeing increased production and decreased production by share of household income from agriculture. Year 2012. N=1669.

Share of income	0 %	1-24 %	25-49%	50-74%	75-99%	100%
Increase, %	33.1	27.3	35.6	46.5	49.3	30.4
Pearson chi square: 44.363. Sig: 0.000						
Decrease, %	16.2	19.9	16.9	16.7	17.1	16.7
Pearson chi square: 2.622. Sig: 0.758						

In this case there is a very strong connection between share of income from agriculture and expectations of increased production, which could be expected, while there is no such relationship with expectations of decreased production. This means that the share of farmers expecting decreased production is approximately the same independent of share of household income stemming from agriculture. When it comes to expectations of increased production there is a clear variation. Ignoring the two outer categories, the expectations of increase is highest on farms where the share of household income from agriculture is highest. Farms where the share of income from agriculture is either very low or very high has low expectations concerning increase in production.

Region

The region where the farm is located may also have an impact on the view on future production. Natural production conditions, structure of subsidies, access to markets, as well as external factors as e.g. labour markets and other conditions vary considerably from the north to the south in Norway, and between lowland and highland areas. The division in regions we use here is done on county level. We have grouped the 19 counties in Norway into seven regions, which are relatively homogeneous when it comes to conditions for agriculture. 'East, lowland' consists of the four counties in the lowland around the Oslofjord: Østfold, Vestfold, Akershus and Oslo. 'East, inland' is the three counties in the inland north and north-west of 'East, lowland': Hedmark, Oppland and Buskerud. This region has grain producing areas in addition to valleys and mountainous agriculture with mainly livestock farming. 'South' are the counties Telemark, Aust-Agder and Vest-Agder. This region has a relatively scanty and hilly farmland. Rogaland is one county and includes the most intensive livestock producing area in Norway, Jæren, south of Stavanger. 'West' corresponds to the three other counties in Western Norway: Hordaland, Sogn og Fjordane and Møre og Romsdal. This is the hilliest region in Norway, with agriculture mostly based on grazing and livestock. In addition there is fruit and berry production. 'Mid' corresponds to Trøndelag, which includes the two counties Sør-Trøndelag and Nord-Trøndelag. This is a versatile agricultural region both when it comes to plant production and livestock production. 'North'

is the three northernmost counties Nordland, Troms and Finmark. Agriculture here consists mainly of graze-based livestock productions.

Table 5. Share of farmers foreseeing increased production and decreased production in various farming regions in Norway. Year 2012. N=1669.

Region	East, lowland	East, inland	South	Rogaland	West	Mid	North
Increase, %	29.6	33.8	33.3	39.2	29.7	32.8	41.4
Pearson chi square: 10.894. Sig: 0.092							
Decrease, %	10.8	16.8	17.6	20.9	23.3	16.0	20.4
Pearson chi square: 18.168. Sig: 0.006							

Table 5 shows that farmers' view on future production varies with region, but the correlation is weaker than for the two factors described above (farm size and type of production). Somewhat surprisingly the correlation between region and assumed *decrease* in production is strong, while the correlation between region and *increase* in production is quite moderate. We see that the share of farmers expecting increase in production is lowest in 'East lowland', the most central region in Norway and with the most productive arable land, and in 'West'. Both these regions have good opportunities for other jobs, which may help explain the moderate expectations concerning agricultural production. Rogaland and Northern Norway have the highest expectations when it comes to increased production. This is a bit surprising since the conditions for agriculture differ considerably between these two regions. Rogaland is seen to have very good natural conditions for productive agriculture, while Northern Norway is situated at the other end of that continuum. Probably though, the explanations diverge between the two regions. Another interesting finding is the somewhat weak connection between increase and decrease expectations. The share of farmers expecting decrease is not highest in the "low increase" region of 'East, lowland'. This implies that east lowlands of Norway – which is a region with high natural production potentials and is located close to the largest home markets in Norway, also is the region where expectations of 'status quo' in agricultural production is most prevalent.

Discussion

The results above show that there among Norwegian farmers over time has been a tendency away from thinking "status quo" towards changed production, be it as increased production or as decreased production. A deviance from this pattern occurred in 2008 which probably was influenced by the peak in food prices and the debate about food crisis that year. Farmers who plan to increase production are characterized by having big farms in terms of agricultural land and a high share of income from farming. Also a relatively high share of milk producers foresee increased production, while grain producers have more modest expectations. The effect of regional localization on farmers' view on production is somewhat less clear. There is a clear connection between region and foreseen decrease in production, while the share of farmers foreseeing increase in production varies little with region. That is, some regions experience a relative decrease in agricultural production not because there are fewer farmers planning increased production, but because more farmers there plan to step down production.

This also means that when it comes to explanatory models, it is important to note that opposite production strategies or expectations – increase or decrease in our case – must be understood and analysed on their own terms. A variable that can explain the one (e.g. increase) cannot necessarily be used to explain the other (decrease).

How do these findings place themselves in relation to results in the literature presented in the introduction? First of all, concerning the national policy target of 20 percent increase in agricultural production, this target will, to the extent that it will be reached, to a large extent be filled through increased production on farms that already have large production. It seems unrealistic

that all types of farms will increase production. The reason why the larger farmers see increased production as a realistic option can be linked to their being relatively more efficient today which again can be tied to farm resources, size of fields, geographical location and contact with other farmers (Hansson, 2007; Kelly et al., 2012). So the eventual challenges connected to increased production will be experienced by "large farms". This also means that the answer is 'yes' on the question if we can observe a greater production orientation in the farming community. But the increased production orientation is not found on all farms, only farms with certain characteristics. However, to what extent 'production orientation' and 'increased production' will be identical to specialization, for example more mono-culture, is not obvious and is more of an open question. Farmers may maintain 'agricultural focus' (Gorton et al., 2008) also through more versatile and complex farming systems such as integration of crop and livestock production (Bell et al., In Press) and arrangements involving crop rotation (Dogliotti et al., In Press). On a more general level, how farmers will react on the new political "directive" of increased production is also an open question. The connections between policy and farmers' practices may not be as direct as one could assume, cf. the findings made by Bradshaw (2004). The findings on the regional and production-type distribution of strategies are somewhat mixed, and more research are needed to get a clearer picture of the distributional consequences of the neo-productivist turn of Norwegian agriculture.

Conclusion

Unsurprisingly, the findings in this paper indicate that the structural development in the direction of larger farms will continue. The largest farms, driven by farm families that generate more of their income from agriculture can be expected to take even larger shares of the agricultural production in the future. Our findings do however not indicate that there has been a sudden or marked shift in this development. On the contrary, a steady and continued development of change in the direction of larger producers is that patterns that is revealed from this study. To the degree that a neo-productivist shift open new possibilities for farmers of all kinds and sizes, this has not as yet translated into the strategies and expectations of the farmers.

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