



Observation:
What is the above spread in crop management: Unplowed, plowed, seedbed, transplanting and transplanted = 8 weeks?
What does this represent:
A. A few highly motivated farmers getting their crop planted on time, and other lagging behind, or
B. All farmers getting some fields done early and others done later?
Is this delay **Voluntary** or **Involuntary**?
Will farmers' diet explain this delay? Isn't it the manual labor fuel?



If manual crop establishment takes 300 hrs/ha at 4 hrs/day, how long will it take this couple from Sri Lanka to establish a ha of paddy?
Will that explain the 8 week spread shown above?
What will the decline in potential yield be after 8 weeks?
Working only with hoes can they possibly dig their way out of poverty?

Dietary Energy Requirement:

- Basic Metabolism 2000 kcal/day
- Manual labor 300 kcal/hr including basic metabolism (net 220/hr kcal additional)
- 8 hour work day requires $(2000 + \{220 \times 8\}) = 3760$ Kcal or rounded to 4000 Kcal/day
- What constitutes 4000 Kcal?



How much time would it take just to consumer any example of 4000 kcal?

Commentary

- Typically smallholders will have access to only 0.5 to 0.75 of the dietary calories needed for a full day of agronomic field work.
- After accounting for basic metabolism this results in a diligent work day of zero to 4 hrs. and becomes a major impediment to implementing development innovations designed for their benefit.
- It may sound trivial that you cannot expect a hungry person to work hard, but isn't that what we have expected for the past 40 years?
- Contrary to traditional belief, instead of being labor surplus, most smallholder communities are severely labor deficient.
- Also, smallholder farmers cannot be risk averse in establishing their crops but are mandatory risk takers, with their very survival depending on it. Any deliberate delay only reduces the total area cultivated and risks food security.
- Reviewing the stereotype of African males loafing around the village in the afternoon, what is more likely: they are lazy in need of some form of motivation, or hungry and exhausted in need of a good hearty meal?
- Who is, or should be, responsible to determine the operational limits of smallholder farmers, caloric or otherwise? Is this an administrative void in the development effort!!!
- What is the possibility the apparent limited acceptance of agronomic recommendations is an optimizing the recommendations to the limited operational capacity of the farmer including limited labor? Most affected would be time of planting, plant populations, quality of weeding, etc.

Survey

1. Given the current interest in improving the quality of diet of smallholders to address malnutrition in terms of limited protein, along with various vitamins, minerals, etc., from the farmers' perspective what will be the higher concern, improved nutrition or sufficient calories to complete the day's task? Note the improved nutrition virtually always cost more, thus it can only be done by reducing the caloric intake, and work hours.
2. If we advocate innovations that require smallholders to routinely exert more caloric energy than they access to, are we inadvertently promoting their *genocide* by starvation as a *crime against humanity* subject to referral to the International Criminal Court (ICC) in The Hague?

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Ethiopia Case Study

- Casual agriculture labor wage: 50 Birr/day = US\$ 2.63
- Maximum available for food = 80% or 40 Birr/day, with the rest going for fuel, light, housing etc.
- Food Purchased based on **Consumer Prices** in Addis Ababa.

Kinds	Amount in g/day	Daily Price (Birr)	Actual Kcal Purchased
Beef	64.5	3.33	88.4
Wheat	645.2	5.67	2,154.8
Maize	1,290.3	7.33	4,696.8
Teff	645.2	9.30	2,367.7
Sorghum	483.9	3.00	1,640.3
Chickpea	322.6	3.33	1,174.2
Onion	161.3	0.83	64.5
Potato	322.6	2.00	187.1
Coffee	32.3	3.00	0.0
Sugar	64.5	1.00	249.7
Pepper	32.3	0.92	21.6
Salt	32.3	0.13	0.0
Veg. Oil	32.3	0.73	286.1
Total		40.57	12,931.3

Family to support and calories distribution	
Family Member	Kcal Distribution
Husband	3,000
Wife	3,000
Adolescent Son	3,000
2 Younger Children	2,000 * 2
Total	13,000

Typical Kcal/Day Available to Smallholders		
Location*	Kcals*	Workable Hours**
Ghana	2,930	4.2
Bangladesh	2,480	2.1
Tanzania	2,140	0.5
Zambia	1,880	Not Able to Work
Kerala, India	2,010	0.0

The 3000 kcal for Ethiopia is at the high range for smallholder farmers

*Source: <http://www.odi.org.uk/sites/odi.org.uk/files/odi-assets/publications-opinion-files/8376.pdf>
** (Kcal - 2000)/220

Potential hours of diligent labor

- From 3000 kcal/day must subtract 2000 kcal/day for basic metabolism
 - $3000 - 2000 = 1000$ to be allocated for manual labor
 - Diligent hourly agriculture field labor exertion consume on average 300 kcal/hr., but this includes 83 kcal of basic metabolism
 - Net hourly exertion $300 - 83 = 217$ kcal over and above basic metabolism.
 - Available kcal /rate of exertion is $1000/217 = 4.6$ hr/day.
 - Working longer would imply pacing to reduce amount of calories exerted or starving.
 - To diligently work a full 8 hrs. /day requires a diet of at least 3750 kcals.
 - While the case study is for purchasing power of casual wages, subsistence stock are similar with Malawian farmers holding 200 kg of maize per adult and Millennium Village Project in Africa* holding 1.1 MT of maize per family of 5.7, both result in daily diet of slight less than 2000 kcal. Meets basic metabolism, but limited work unless supplemented
- Source: <http://www.pnas.org/content/104/43/16775.full>

Implications for Poverty Alleviation

- Assisting smallholders needs to emphasis drudgery relief and avoid labor intensive innovations.
- This quickly implies enhancing access to mechanization (All mechanization was under the development community's radar and not acknowledged in any reporting)
 - Asian solution for rice was shift from buffalo to power tillers
 - Double the farm size from 1.5 to 3 ha.
 - How much of success of the green revolution in Asia was technology vs. concurrent shift to power tillers? If left only with buffalo how limited would the area be?
 - Now Asia mechanizing harvest with small combines increasing crop intensity to 5 rice crops in 2 years.
 - African solution slowing getting access to contract tillage
- If women are equally undernourished relative to their work requirements, and domestic work takes priority over economic work, how will that effect income generation for women or women groups?
- Indirect methods of drudgery relief (domestic drudgery)
 - Grain mills
 - Improved domestic water supply
 - What would be the agronomic impact on these innovations?
- Development project need to assess dietary energy when promoting innovations
- Nutrition studies need to be based on providing a balanced diet of at least 4000 kcal.
- Likewise, wages need to be based on ability to buy a balanced diet of at least 4000 kcal .

References

- www.smallholderagriculture.com
- ECHO Development Notes: Issue 121, October 2013 <http://c.ymcndn.com/sites/www.echocommunity.org/resource/collection/62026577-227A-4FB0-8B25-B0838484CED7/Issue121.pdf>
- Ethiopia Case Study: <http://lamar.colostate.edu/~rtinsley/EthiopiaDiet.html>